REPORT

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REMEDIAL INVESTIGATION ADDENDUM REPORT

Bausch & Lomb Frame Center

Chili, New York

September 1994
Revised June 1995

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

Remedial Investigation Addendum Report

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Table of Contents

Table of Contents

TABLES

Table of Contents

Executive Summary

Results of this Bausch & Lomb Frame Center Site Remedial Investigation Addendum, which was completed to supplement the October 1993 Remedial Investigation (RI) Report, are the following:

- The source(s) of volatile organic compounds (VOCs) observed in ground water south of Building 41 is not a point source, but rather is a source area where dispersed and diffused VOCs are observed with no systematic distribution of constituents. Small volume releases to the ground surface at one or more locations, during one or more events, would account for the distribution of VOCs observed in soil and ground water at this site.

- Shallow overburden ground-water monitoring wells BL13S and BL-14S which are located downgradient of the apparent source area yield ground-water samples that do not contain detectable concentrations of VOCs, or contain only low concentrations of VOCs (less than 10 parts per billion [(ppb)]). Based on these results, the southeastern limit of the unconfined ground-water VOC plume has been defined.

- The monitoring wells screened at the overburden/bedrock interface and located downgradient of the apparent source area yield ground-water samples that do not contain detectable concentrations of VOCs, or contain only low concentrations of VOCs (less than 10 ppb). Based on these results, the limits of the plume in this zone has been defined.

- The analysis of soil samples obtained from the two topsoil piles located south of Building 40 indicate that observed concentrations of the site-specific metals, cadmium, chromium, lead, mercury, nickel, silver, vanadium, and zinc, are consistent with concentrations of these metals in site-specific background samples.

- The site geology is consistent with interpretations and findings presented in the previous RI. The site is underlain by 19 to 35 feet of a heterogeneous mixture of glaciolacustrine and till units. The bedrock is composed of siltstone and has a weathered upper portion.

- The shallow overburden and overburden/bedrock interface ground-water flow zones are interpreted to have a primary ground-water flow direction to the southeast, with minor localized flow components to the southwest, east, and north. Ground-water flow velocities range from 6.3 to 23.7 feet per year (ft/yr) in the shallow overburden to 44.8 to 62. 9 ft/yr in the base of overburden/top of rock.

- The estimated risks associated with hypothetical excavation workers and residential exposure scenarios were evaluated for the area. The risks estimated for a hypothetical excavation worker were found to be well below the United States Environmental Protection Agency's (USEPA) target risks whereas the risks associated with potential residential exposures were found to be above the EPA's target risks. The assumptions used in the risk calculations, however, are inherently conservative and residential exposures pathways do not currently exist at the site and are not likely to exist within the reasonably conceivable future. As part of this analysis, and as required by the consent order, USEPA guidance documents and hence EPA target risk ranges were used to evaluate the risks associated with these potential exposure scenarios. We understand that the NYSDOH does not currently recognize the concept of de minimis risk and, therefore, does not recognize USEPA's target risk ranges.

- This RI Addendum has addressed and satisfied each of the data gaps presented in the October 1993 RI Report. During the Addendum investigation activities:

  - The limits of the VOC plume were sufficiently identified south and downgradient of the monitoring well clusters BL-9, BL-10, and BL-11;

  - The nature and quality of the topsoil mounds south of the main Frame Center building were investigated and found to contain concentrations of the eight site-specific metals at concentrations comparable to background concentrations; and

  - The risks associated with several additional exposure scenarios for the area south of Building 41 were evaluated.

- The information developed during this and previous investigations have sufficiently characterized the area, and completion of the Feasibility Study is now warranted.

1.0 Introduction

1.1 General

The Bausch & Lomb Frame Center (Frame Center site) in Chili, New York, is listed as a Class 2 site on New York State's Registry of Inactive Hazardous Waste Disposal Sites (Site Identification Number 828061). To address the issues that resulted in this listing, Bausch & Lomb completed a Remedial Investigation (RI) of the Frame Center site under an agreement with the New York State Department of Environmental Conservation (NYSDEC). The results of the RI were detailed in the "Frame Center RI Report," prepared by Blasland, Bouck & Lee, Inc. (BB&L), and submitted by Bausch & Lomb to the NYSDEC in January 1993. Following submittal, the NYSDEC provided comments on the RI Report to Bausch & Lomb. In response to these comments, revisions were made and the report was resubmitted to the NYSDEC in October 1993. The results of the investigation indicated the following:

- A variety of volatile organic compounds (VOCs), including benzene, chlorinated hydrocarbons, and several metals, were present in soil and ground water in the area south of Building 41. The source of the benzene was attributed to an underground gasoline storage tank that was formerly located at the northwestern corner of Building 41. The source and extent of the chlorinated hydrocarbons in the ground water were not fully defined; and

- Analyses of sediment samples collected from the SPDES stream bed area (SSA) indicate that VOCs, polynuclear aromatic hydrocarbons (PAHs), and elevated concentrations of metals were present. The concentration of metals in the SSA exceed the state's sediment criteria for aquatic organisms; the on-site SSA, however, is considered a limited habitat. Off-site sampling showed no adverse impacts to Black Creek.

The RI of the SSA has been completed, and the Draft On-Site SSA Interim Remedial Measure Work Plan was submitted to the NYSDEC in March 1995. Additional investigations, however, were warranted in the area south of Building 41. These additional investigations, as detailed in this RI Addendum report, were proposed for the following reasons:

- The limit of VOCs in ground water south and downgradient of monitoring well clusters BL-9, BL-10, and BL-11 were not defined during work activities completed during the RI;

- A definite source of the VOCs had not been located; and

- The NYSDEC requested that sampling of topsoil piles located south of Building 40 be conducted. The top soil piles had previously not been included as an area of concern in the RI.

To address these data needs, an RI Addendum was proposed. The objectives of this investigation were to:

- Locate, if possible, the source of contaminants identified during the previous RI investigation;

- Delineate the extent of VOCs in ground water south and downgradient of monitoring well clusters BL-9, BL-10, and BL-11;

- Assess the quality of the two topsoil piles located south of Building 41;

- Further characterize the geology and hydrogeology at the site; and

- Evaluate several additional human exposure routes, including hypothetical residential use and excavation workers exposure scenarios.

The activities performed by BB&L for the RI Addendum at the Frame Center site were conducted in accordance with the NYSDEC-approved, November 1993 "Remedial Investigation Addendum Work Plan," as amended by correspondence from Bausch & Lomb to the NYSDEC dated December 10, 1993; December 20, 1993; January 10, 1994; and April 6, 1994; and correspondence from the NYSDEC to Bausch & Lomb dated February 11, 1994 and May 31, 1994; hereafter referred to collectively as the RI Addendum Work Plan. Work activities for the RI Addendum were initiated in February, 1994, and included:

- Shallow-soil sampling;

- Installation of temporary ground-water monitoring points;

- Installation of soil borings, subsurface soil sampling, and installation of ground-water monitoring wells;

- Topsoil-pile sampling;

- Ground-water sampling;

- Water-level gauging; and

- Preparation of a Baseline Risk Assessment (RA) Addendum.

This report includes the results of these work activities. Following approval of the RI Addendum, a Feasibility Study for this area will be completed.

Chemical analyses for the RI Addendum were performed by OBG Laboratories, Inc., of Syracuse, New York. The analyses were completed in accordance with the most recent NYSDEC Analytical Service Protocol (ASP), and data validation was completed by Galson Laboratories, Inc., of Syracuse, New York.

1.2 Background Information

A significant portion of the information provided in this section was previously presented in the October 1993 RI Report. This information is reiterated here to provide a framework in which to discuss the findings of the current investigation.

As shown on Figure 1, the Frame Center is located on the south side of Paul Road, approximately 1½ miles east of the intersection of State Route 33A and Paul Road in Chili, New York. Prior to construction of the Frame Center in 1961, a farm and associated buildings appear to have been present on the property. The Frame Center was enlarged in approximately 1966. Operations at the facility include production of plastic and metal eyeglass frames. A variety of materials, including solvents and plating metals, have been and are still used at the Frame Center in connection with the facility's operation.

The approximately 89-acre Frame Center site is bordered on the north by Paul Road, on the south by Conrail railroad tracks, and on the east and west by generally undeveloped land, as shown on Figure 2. The irregularly shaped site has approximately 1,500 feet of frontage on Paul Road. From Paul Road, the eastern property boundary extends some 2,400 feet south to the Conrail tracks. The southern boundary extends along the tracks to the west approximately 2,250 feet. The western boundary extends approximately 400 feet to the north, 750 feet to the east, and then 1,850 feet to the north, back to Paul Road. An 8-foot-high chain-link fence runs along the southern and most of the eastern and western site boundaries.

The Frame Center facility comprises one main building (Building 40) located in the northern portion of the property and a smaller building (Building 41) located adjacent to and south of Building 40. Building 40, which occupies approximately 354,000 square feet, houses the production area, as well as office, cafeteria, and other associated facilities.

Paved parking areas abut the western sides of both buildings, and a paved driveway runs along the eastern side of Building 40 and between Buildings 40 and 41. A small, gravel-covered general parking area adjoins the southern side of the main parking area southwest of Building 41. The portions of the site not covered by buildings, parking areas, or roadways are generally well vegetated. The area immediately north of Building 40 and south of Paul Road is covered with grass and landscape vegetation, and the area immediately south of Building 40 and east of Building 41 is lawn covered.

Building 41, occupying approximately 5,000 square feet, houses the facility's vehicle maintenance area and general storage. Building 41 formerly served as the facility's hazardous waste storage area, but in 1992, a new waste storage area was constructed along the eastern side of the main building, and hazardous wastes are no longer stored in Building 41. A fenced enclosure of approximately 6,250 square feet located adjacent to the eastern and northern sides of Building 41 is currently used for general storage.

South of the buildings and parking areas, the property is covered with open-field-type vegetation, including grasses, shrubs, and herbaceous plants. Trees up to 4 to 5 inches in diameter are present, most growing along the culverted stream bed at the southwest corner of the property and the extreme southeastern corner of the site.

The property generally slopes toward the south from an elevation of just over 560 feet National Geodetic Vertical Datum (NGVD) above sea level at the northeastern corner of the site to a low point just under 525 feet above sea level at the southeastern corner. Near the center of the western site boundary, the ground surface rises to a localized high of just over 550 feet. This rise drops away in all directions, with the low point between the rise and the northern portion of the site at an elevation of approximately 545 feet. This low point is located near the southwestern corner of Building 40. Two much smaller mounds composed of stockpiled topsoil are present approximately 500 feet south of Building 40.

Based on topography, the surface-water flow at the property is dominated by two general flow patterns. The storm-drain and surface-water discharge system dominates the northern and western portions of the property, while the southeastern portion of the property drains to the east. Surface water from the paved areas of the site discharges to the SSA, along with the facility's permitted non-contact cooling water. Two small tributaries also drain into the SSA from the west. As shown on Figure 2, one of the minor tributaries enters the SSA near the headwall, approximately 600 feet from the southern edge of the property, and the second enters the SSA just north of the railroad culvert at the southern edge of the site. From the railroad culvert, water from the SSA flows to the south, where it joins Black Creek approximately 1,500 feet south of the railroad tracks. Black Creek flows to the east and joins the Genesee River just over 2 miles east of the confluence with Black Creek.

2.0 Field Methodologies

The field procedures and protocols used during implementation of the RI Addendum are presented in detail in Appendix A. Unless otherwise specified, the activities conducted during the investigation and the dates of performance were as follows:

- February 28 and March 11, 1994, soil samples were collected from the shallow soil sampling area south and southeast of Building 41;

- March 15-28, 1994, five temporary ground-water monitoring wells and six permanent monitoring wells were installed;

- March 24-30, 1994, the newly installed permanent monitoring wells were developed, and on April 20, 1994, hydraulic conductivity tests were performed on the new wells and on existing wells BL-4D and BL-5D;

- March 16, 1994, ground-water samples were collected from the five temporary monitoring wells, and on April 11-12, 1994, ground-water samples were collected from the new and existing permanent monitoring wells;

- March 31, 1994, soil samples were collected from the two topsoil piles; and

- April 10 and July 12, 1994, water levels were obtained from all the permanent ground-water monitoring wells.

During most of the activities listed above, a NYSDEC on-site representative was present for the initiation of each activity. An on-site BB&L geologist was responsible for overseeing all field activities during this investigation.

3.0 Site Geology

3.1 General

Before this investigation was conducted, a total of 22 ground-water monitoring wells had been installed at the Frame Center site. Six additional monitoring wells were installed during this investigation, bringing the total number of monitoring wells to 28. The location of each of the monitoring wells is illustrated on Figure 3. The subsurface logs generated during the installation of these wells are included as Appendix B. Grain-size and hydrometer analysis was completed on each of the samples collected from the boring completed at BL-14. The grain size distribution curves are included as Appendix C. The information gathered from this investigation and from the initial RI (BB&L, 1993a) has been used to further develop a geologic framework for the site, as described in the following sections.

3.2 Geologic Setting

The subsurface geological information obtained during implementation of the RI Addendum at boring locations BL-13, BL-14, BL-15, and BL-16 is generally consistent with the geologic conditions observed in the initial RI. This new subsurface information has been used in conjunction with the geologic data gathered previously to further develop a conceptual geologic model for the site. A review of the subsurface information developed during implementation of the RI Addendum is provided below.

The bedrock at the BL-13, BL-14, and BL-15 locations was found to be composed of a greenish-gray siltstone interpreted to be part of the Silurian Vernon Formation, which consists of shales and dolostones (Fisher, 1971); the upper portion of this formation was found to be weathered. The top-of-rock elevation contours are depicted on Figure 4. The elevation contours indicate that the top-of-rock surface generally drops to the south, with the lowest elevation occurring near BL-14D. This configuration of the top-of-rock surface is consistent with the findings made in the initial RI.

The bedrock is generally overlain by a gray to red-brown silty sand deposit, with variable amounts of interbedded clays and gravels. A gray-to-brown till, present at BL-13, BL-14, and BL-15, varies in thickness and stratigraphic position. The thickness of the till ranges from approximately 4.0 feet at BL-14 to approximately 10.5 feet at BL-13. At the BL-13 and BL-15 location, the till unit is separated from the underlying top-of-rock zone by a horizon approximately 4.5 to 5.0 feet thick composed of relatively conductive sands and gravels. This horizon was less pronounced at the BL-14 location, where the till appears to grade downward into a till-like material consisting of a dense, silty sand that directly overlies bedrock.

At the BL-14 location, however, a fine-to-medium sand zone was observed above the till. This sandy zone extends from approximately 14 to 18 feet below grade. This sandy zone was not present in a significant thickness at monitoring well clusters BL-13 or BL-15. Cross-section Figures 5 and 6 illustrate the stratigraphic complexities typical of this site: the sands are locally interbedded or overlain with silts and fine gravels, and the materials directly above and below the till vary in composition and thickness. The stratigraphy of the site indicates that the overburden materials were probably deposited into a lake at or near the glacial ice front during glacial retreat. This depositional environment can account for the heterogeneous nature of the sediments observed in this area.

Fill materials are locally present at the site. During the RI Addendum, fill was observed in the upper 4 feet at the BL-13 location and was composed of soil mixed with debris containing pieces of wood, concrete, and asphalt. This fill is thought to be associated with the placement of roadway fill in an area leading to the topsoil piles south of monitoring well cluster BL-13.

The grain size distribution curves, provided in Appendix C, document the relatively fine-grained texture of the overburden materials at the site. Typically, the samples contain more than 50 percent fines (silt and clay), with the range in fines from approximately 40 to 85 percent. The balance consists of 10 to 50 percent sand with only 5 to 20 percent gravel.

4.0 Site Hydrogeology

4.1 General

Of the 28 on-site monitoring wells, 17 were designed to monitor ground-water conditions in the shallow overburden, and 11 were designed to monitor conditions at the overburden/bedrock interface, as summarized in Table 1. Three overburden wells and three overburden/bedrock interface wells were installed as part of the RI Addendum. The well installation procedure and rationale for positioning the wells are presented in Appendix A-1. Water levels were obtained from all of the wells on April 10 and July 12, 1994, following procedures outlined in Appendix A-2. A discussion of the shallow overburden and overburden/bedrock interface ground-water conditions is presented in the following sections.

4.1.1 Shallow Overburden Ground-Water Conditions

Figure 7 depicts the ground-water elevation contours developed from water-level data collected in the shallow overburden monitoring wells on April 10, 1994. These elevation contours indicate that ground-water flow in the shallow overburden is generally from the north to the south-southeast. A slight ground-water mound, which appears to locally divert flow in this area to the northwest, was observed in the vicinity of clusters BL-11 and BL-2.

Ground-water contours developed from the water-level measurements collected on July 12, 1994, indicate that the overburden ground-water flow is generally from the north to the south-southeast, as shown on Figure 8. A localized north and southwest component of flow is present in the BL-2 area as the result of a ground-water mound in this vicinity. A ground-water high is also present in the BL-16 area, which apparently creates a small component of flow to the northwest toward the BL-10 cluster.

The ground-water elevation summary in Table 2 shows that the ground-water elevations fluctuate up to 6 feet between April 1994 and July 1994. The changes in the ground-water flow patterns between April and July 1994 are apparently related to seasonal ground-water fluctuations. The seasonal variation in ground-water levels is consistent with the previous data generated for the site, as is the general configuration of the water-table surface.

4.1.2 Overburden Ground-Water Flow Velocity Estimates

Results of the in-situ hydraulic conductivity tests performed in the newly installed wells are presented with the existing hydraulic conductivity data on Table 3. The testing protocol and data computation sheets are presented in Appendices A-3 and D. Overburden ground-water flow velocity estimates were generated from selected areas identified as containing ground water with elevated VOC concentrations, and the geometric mean of the hydraulic conductivity values along two apparent ground-water flow lines were calculated to provide an estimate of potential ground-water flow velocity. The flow lines, derived from the April 10, 1994 shallow overburden ground-water contours on Figure 7, represent the apparent ground-water flow directions from BL-11S to BL-14S, and from BL-9S to BL-13S. The April 10, 1994 elevation contours were used for this assessment rather than the July 12, 1994 contours because the water-table surface in April appeared to be smoother, with fewer convolutions and complications. The ground-water gradients calculated during these two time periods, however, were essentially similar.

The velocity of ground-water flow along these flow lines was calculated using the following formula:

$$V = Ki/n_e$$

Where: V = ground-water velocity (feet/day);
K = hydraulic conductivity (feet/day);
i = horizontal hydraulic gradient (feet/feet); and
n_e = effective porosity = 0.3.

The parameters and calculated flow velocities are presented in the following table:

Points on Flow Line and Corresponding K Values			Geometric Mean K		Horizontal Gradient	Calculated Flow Velocity		
	cm/sec	ft/day	cm/sec	ft/day	(ft/ft)	cm/sec	ft/day	ft/yr
BL-9S	2.5×10^{-4}	0.71	2.45×10^{-4}	0.69	0.028	2.3×10^{-5}	0.06	23.7
BL-13S	2.4×10^{-4}	0.68						
BL-11S	3.3×10^{-4}	0.94	1.14×10^{-4}	0.32	0.016	6.1×10^{-5}	0.02	6.3
BL-10S	1.6×10^{-3}	1.59						
BL-16S	4.3×10^{-5}	0.12						
BL-14S	1.8×10^{-5}	0.06						

4.1.3 Overburden/Bedrock Interface Ground-Water Flow Direction

The potentiometric surface contours for the overburden/bedrock interface developed from the April 10, 1994 water-level measurements indicate that ground-water flow in the area southeast of Building 41 is generally to the southeast-east, as shown on Figure 9. In the vicinity of BL-11D and Building 41, the ground-water contours depict a relatively shallow gradient, with a localized ground-water depression in the BL-6 area. The ground-water contours developed from the July 12, 1994 data (Figure 10) are generally consistent with the contours developed in April, with the exception that water levels were approximately 3 feet lower in July than in April.

4.1.4 Overburden/Bedrock Interface Ground-Water Flow Velocity Estimates

Results of the hydraulic conductivity tests performed on all the wells are presented in Table 3. The testing procedure is discussed in Appendix A-3, and data computation sheets are presented in Appendix D. Two apparently representative ground-water flow lines were selected, which were derived from the April 10, 1994 overburden/bedrock interface ground-water contours, as shown on Figure 9. As with the shallow overburden ground-water-velocity calculations, the April 1994 data were selected for this analysis rather than the July data because the ground-water flow conditions in April appear to be less complicated. Ground-water flow velocities from BL-9D to BL-13D and from BL-10D to BL-14D have been calculated. The ground-water flow velocity along these flow lines were derived using the formula: $V = Ki/n_e$, as described in Section 4.1.2.

The parameters and calculated flow velocities are presented in the following table:

Points on Flow Line and Corresponding K Values			Geometric Mean K		Horizontal Gradient	Calculated Flow Velocity		
	cm/sec	ft/day	cm/sec	ft/day	(ft/ft)	cm/sec	ft/day	ft/yr
BL-9D	4.1×10^{-3}	11.62	4.5×10^{-4}	1.28	0.029	4.3×10^{-5}	0.12	44.8
BL-13D	4.9×10^{-5}	0.14						
BL-10D	1.6×10^{-3}	4.54	5.4×10^{-4}	1.52	0.034	6.1×10^{-5}	0.17	62.9
BL-14D	1.8×10^{-4}	0.51						

4.1.5 Overburden/Bedrock Flow Relationship

The ground-water flow velocities in the shallow overburden appear to be consistently lower than the flow velocities in the overburden/bedrock interface zone. The shallow overburden consists largely of fine sands and silts, and typically has a lower hydraulic conductivity than the coarser material in the overburden/bedrock interface zone.

The ground-water elevations from wells within each of the nine monitoring well clusters on site were compared to yield information on the vertical hydraulic gradient at each cluster location. Table 4 contains the April 10 and July 12, 1994, water elevations and gradient information. The vertical gradient distributions for April 10 and July 12, 1994, are shown on Figures 9 and 10, respectively. Based on this data, well clusters BL-2, BL-6, and BL-14 consistently displayed a downward hydraulic gradient was ranging from 0.048 ft/ft at BL-6 to 0.298 ft/ft at BL-2 in April 1994. An upward gradient was consistently present at BL-9, BL-11, and BL-13, ranging from 0.008 ft/ft at BL-10 to 0.087 ft/ft at BL-9 during April 10, 1994. The vertical hydraulic gradient measured at clusters BL-4, BL-5, and BL-11 varied between gauging rounds.

5.0 RI Addendum Analytical Results

5.1 General

The results of the analytical sampling programs completed during implementation of the RI Addendum are discussed in the following sections. The raw laboratory data generated by OBG Laboratories, the validation documents by Galson Laboratories, and OBG Laboratories' supporting data will be provided to the NYSDEC under separate cover.

For the RI Addendum field programs, the resulting analytical data are included in the text, text tables, and figures when the results are considered "usable." The usability of the data was evaluated based on: 1) the qualifiers, if any, added by the laboratory or during validation that indicate potentially compromised analyses; 2) the general consistency with other data and observations from the sampling area/location; and 3) the relative detection limit for a particular sample.

These factors were considered as follows:

1) Qualifier added to the analytical results by the data validators:

   V - Estimated value; qualifier added during data validation. If a concentration is flagged with this qualifier, the data validator has indicated that there may have been some analytical noncompliance or analytical difficulties encountered during the sample analysis. For the purpose of this discussion and unless there is some other reason to reject the data (such as blank contamination), we have assumed that the value is correct as reported.

   This qualifier was added by the data validator for the compound Freon 113 for most of the samples obtained during the shallow soil sampling program south and southeast of Building 41. A "V" qualifier is applicable since a standard was not analyzed specifically for the compound during this portion of the analytical program. The laboratory, however, was able to estimate the concentration of Freon 113, where present, based on standards run following the completion of the sample analysis. This was reviewed with NYSDEC project personnel during a site meeting on March 22, 1994. The NYSDEC agreed that resampling to refine the concentration estimate for Freon 113 in these samples was not warranted.

   R - Rejected data; due to analytical noncompliance or analytical difficulties, the data validators have rejected that particular analysis. Throughout the analytical program several VOCs were rejected for insufficient calibration. The rejection of the analytical results for these compounds does not impair the findings of this investigation for the following reasons:

   - None of the VOCs flagged as rejected were previously detected at this site during any of the previous investigations, nor would they be likely to be found at this site based on the documented site chemical-use history.

- During this investigation, VOC analyses were also performed by two other laboratories, and the compounds flagged as rejected were not detected in any of the samples run by either of these labs. While the analyses performed by the other labs were not completed under the ASP program, these analyses can be used as a guide to evaluate the potential presence of the compounds rejected during validation. Analyses were completed by:

  - General Testing Corporation during the temporary monitoring well installation program on ground-water samples. These samples had a wide range of contaminant loadings, and none of the compounds flagged as rejected were detected in any of the samples analyzed during this phase of the investigation.

  - The NYSDEC split soil samples and obtained "pore water" samples during the shallow soil sampling program. None of the rejected compounds were detected in any of these samples.

2) General consistency of the data:

   The large size of the data set generated for the RI Addendum and previous site investigations allows for an overall review of the data. The review was focused on determining whether a particular data point was or was not in general agreement with the site conditions or analytical results for a particular area. The data was found to be internally consistent and is, therefore, usable as reported.

3) Relative detection limit:

   Some organic analyses have elevated detection limits due to matrix interferences or elevated concentrations of constituents of concern. In the cases where there are elevated detection limits and a compound is detected below the quantitative limit, the compound is probably present in the sample.

The analytical results of the soils and ground water generated as part of the RI Addendum consisted of samples obtained from:

- Shallow soil sampling area (soils);
- Soil borings (soils);
- Topsoil piles (soils); and
- Permanent monitoring wells (ground water).

A discussion of the analytical results is presented in the following sections.

5.2 Soil Analytical Results

5.2.1 Shallow Soil Sampling Area

A total of 49 soil samples were collected for VOC analysis from the shallow soil sampling area shown on Figure 11. The methodology and purpose of this sampling program are presented in Appendix A-4.

The complete analytical results for the samples obtained from this area are summarized in Appendix E-1. Figure 11 and Table 5 contain only the VOCs that were detected. The VOCs detected are as follows:

Compound	Maximum Observed Concentration in ppm* (location)
1,2-Dichloroethylene (Total)	0.2 (0, 100)
Dichloromethane	0.004 (-25, 225)
Ethylbenzene	0.15 (50, 100)
1,1,2-Trichloroethane	0.004 (0, 100)
Trichloroethylene	0.22 (-100, 175)
Trichlorofluoromethane	0.016 (-150, 150)
Xylenes (Total)	0.004 (-50, 200)
Freon 113	0.003 (-25, 100)

*ppm = parts per million

With the exception of an area along the western survey perimeter, the data show a nonsystematic distribution of VOCs at generally low concentrations in shallow soil sampling area. Sample locations with non-detect levels of VOCs are intermixed with sample locations with detected VOCs, and the chemistry of the detected VOCs typically varies between sample locations. These factors indicate no readily evident contaminant point source. Slightly higher VOC concentrations were detected at the western portion of the grid. This area generally corresponds to the VOC plume previously identified during the RI. Analytical results of samples obtained from the north, east, and south perimeters show that total VOC concentrations are below 0.02 ppm, with the exception of sample point 0, 250 at which total VOC concentrations (composed of only ethylbenzene) of 0.071 ppm were detected.

5.2.2 Soil Borings

A total of seven soil samples were collected and submitted for VOC analysis from six borings, as shown on Figure 12. The methodology and rationale of sample collection is presented in Appendix A-1. The complete analytical results of the samples obtained from the borings are summarized in Appendix E-2. Figure 12 and Table 6 contain only the VOCs that were detected. The VOCs detected are as follows:

Compound	Maximum Observed Concentration in ppm (location)
1,2-Dichloroethylene (Total)	0.004 (BL-13D, 26'-28')
Toluene	0.004 (Duplicate of BL-15D, 30'-32')
Trichloroethylene	0.082 (B-4, 10'-12' and 12'-14')

No VOCs were detected in soil samples collected from the following:

BL-13S (10'-12');
BL-14S (18'-20'); and
BL-14D (34' - 36').

Soil samples were also collected, as described in Appendix A-1, from the borings and analyzed for total organic carbon (TOC) content.

The following table summarizes the TOC results.

Sample (ft.)	TOC (ppm)
B-4 (10-12)	389
B-4 (12-14)	571
BL-13S (12-14)	716
BL-13D (28-30)	579
BL-13D (32-34)	1,408
BL-14S (18-24)	569
BL-14D (30-34)	727
BL-14D (36-40)	678
BL-15D (28-30)	1,228
BL-15D (34-38)	563

5.2.3 Topsoil Piles

On March 31, 1994, 16 discrete soil samples and two composite soil samples were collected from the two topsoil piles located south of the main production building (Figure 3). The samples were analyzed for VOCs and the eight site-specific metals: cadmium, chromium, lead, mercury, nickel, silver, vanadium, and zinc. Appendix A-5 contains the methodology and purpose of the sampling. Tables 7 and 8 summarize the detected VOC and inorganic analytical results, respectively. The complete VOC analytical results are provided in Appendix E-3. Figure 13 shows the distribution and concentration of the detected inorganics and VOCs.

Only dichloromethane was detected in soil samples P2-4 and P2-8, in concentrations of 0.001 ppm at both locations, and at P2-10 in a concentration of 0.002 ppm. No other VOCs were detected in the topsoil piles.

Mercury was not detected in any of the soil samples collected. Cadmium and silver were either not detected or were below the contract required detection limit. The range in concentration of the remaining site-specific metals (chromium, lead, nickel, vanadium, and zinc) are shown below.

Compound	Minimum Observed Concentrations ppm/location	Maximum Observed Concentrations ppm/location
Chromium	9.0/P2-4	26.8/P1-1
Lead	ND/P1-2	24.9/P1-4
Nickel	6.4/P2-4	29.6/P1-1
Vanadium	15.5/P2-4	35.1/P2-2
Zinc	33.0/P2-4	72.3/P2-2

The metals data are plotted on Figure 13. Based on this data, there are no apparent distribution or concentration anomalies.

5.3 Ground-Water Analytical Results

Ground-water samples were collected from the five temporary monitoring wells and analyzed for VOCs. The analytical results were used to determine the locations where the permanent monitoring wells were to be located. Appendix A-6 describes the methodology, rationale, and analytical results of the temporary well ground-water sampling.

On April 11 and 12, 1994, ground-water samples were collected from all of the permanent monitoring wells and submitted for VOC analysis. The methodology and objective of this sampling program is provided in Appendix A-6. A summary of the complete analytical results is presented in Appendix E-4. Figures 14 and 15 show the distribution and concentration of the detected VOCs in the shallow and overburden/bedrock interface zones, respectively, and Table 9 presents a summary of the VOCs detected in the ground-water samples. The following sections present the analytical results of the ground-water samples collected from the shallow overburden and overburden/bedrock interface monitoring wells.

5.3.1 Shallow Overburden

Total concentrations of VOCs detected in the ground-water samples collected from the shallow overburden monitoring wells are as follows:

Location	Total VOCs in ppb*
BL-1	1
BL-2S	2
BL-3	7
BL-4S	51
BL-5S	0
BL-6S	494
BL-7	719
BL-9S	2,410
BL-10S	460
BL-11S	2
BL-12S	7
BL-13S	2
BL-14S	4
BL-16S	73,000

*ppb = parts per billion

As the above table shows, VOC concentrations were present at relatively low levels in ground water from BL-1, -2S, -3, -4S, -5S, -11S, -12S, -13S, and -14S. Higher concentrations of total VOC concentrations were present at BL-6S, -7, -9S, -10S, and -16S. The highest observed concentration of VOCs was detected at BL-16S, where the total VOC concentration of 73,000 ppb consists of 11,000 ppb of 1,1,1-trichloroethane and 62,000 ppb of trichloroethylene. The presence of VOCs at BL-6S, -7, -9S, and -10S is generally consistent with previous ground-water analytical results, presented in the RI. Compared to previous sampling events, the total VOC concentrations have decreased at BL-9S and BL-6S and have increased at BL-7 and BL-10S.

5.3.2 Overburden/Bedrock Interface

Total concentrations of VOCs detected in the ground-water samples collected from the overburden/bedrock interface monitoring wells are as follows:

Location	Total VOCs in ppb
BL-2D	97
BL-4D	0
BL-5	1
BL-6D	0
BL-8r	0
BL-9D	0
BL-10D	0
BL-11D	11,100
BL-13D	1
BL-14D	0
BL-15D	0

As illustrated in the above table, only samples from two locations, BL-2D and BL-11D, contain elevated concentrations of total VOC concentrations. The major compounds comprising the total VOCs at BL-2D are trichloroethylene at 34 ppb and Freon 113 at 57 ppb. The total VOC concentrations of 11,100 ppb at BL-11D consists of:

1,2-Dichloroethylene (total) at 1,200 ppb;
Dichloromethane at 100 ppb;
1,1,1-Trichloroethane at 2,600 ppb;
Trichloroethylene at 6,100 ppb; and
Freon 113 at 1,100 ppb.

The analytical results from BL-2D and BL-11D are generally consistent with previous analytical results.

6.0 Risk Assessment Addendum

6.1 Introduction

This section provides an addendum to the baseline risk assessment (RA) for the area south of Building 41 at the Bausch & Lomb Frame Center in Chili, New York. This addendum is a supplement to the baseline human health RA presented in Section 7 of the RI Report (BB&L, 1993a) and was completed in accordance with the RI Addendum Work Plan (BB&L, 1993b). Analytical data generated during the RI and RI Addendum are used in this assessment to evaluate potential human health risks. Exposure is evaluated for the site under baseline (i.e., unremediated) conditions.

In accordance with the above work plan, the RA Addendum addresses risks associated with inhalation exposure for a hypothetical excavation worker and evaluates hypothetical future residential use of the site.

This RA Addendum was completed in accordance with the most recent USEPA human health RA guidance, specifically:

- U.S. EPA Risk Assessment Guidance for Superfund: Vol. I. Human Health Evaluation Manual (Part A) (USEPA, 1989);
- U.S. EPA Human Health Evaluation Manual Supplemental Guidance: "Standard Default Exposure Factors" 1991a;
- Health Effects Assessment Summary Tables (HEAST), FY-1994 (USEPA, 1994a);
- U.S. EPA IRIS (Integrated Risk Information System) data base (on-line, 1994b).

As requested by the New York State Department of Health (NYSDOH) in conjunction with NYSDEC, this assessment deviates from standard USEPA exposure assumptions in the following ways: 1) the exposure duration for hypothetical residents is evaluated over a 70-year period rather than the USEPA's recommended upper-bound default duration of 30 years; and 2) risks associated with hypothetical exposures to ground water are based on maximum detected concentrations rather than the upper 95 percent confidence limit concentrations. These assumptions are more conservative than those employed by the USEPA.

6.2 Human Health Risk Assessment

The RA Addendum follows the same format as the original baseline RA, and consists of the following steps:

1. Data Evaluation
2. Exposure Assessment
3. Toxicity Assessment
4. Risk Characterization

These steps are discussed in the following sections (6.2.1 through 6.2.4).

6.2.1 Data Evaluation

In this assessment, soil and ground-water data generated during the RI and RI Addendum are considered. These data include: on-site and off-site soil samples; and ground-water samples collected from on-site, background, and downgradient monitoring wells. Details of sampling and analyses of these media are discussed in Appendix A.

Chemicals of interest from soil and ground water were selected according to USEPA (1989) guidance. Chemicals of interest in soil were selected from all on-site soil samples collected from 0 to 8 feet from ground surface (i.e., soil depth likely to be disturbed during excavation or residential construction). For ground water, only chemicals detected in on-site, downgradient monitoring wells were considered.

All chemicals detected at concentrations above the detection limit were included as chemicals of interest for each given medium, unless the chemical is an essential nutrient (e.g., sodium, potassium, calcium, magnesium), or the chemical is attributable to natural background sources (i.e., arsenic and barium in ground water, and metals in soil). In keeping with the USEPA's Hazard Ranking System, metals are considered attributable to natural background sources if maximum observed concentrations are less than three times the maximum observed background concentration. Background soil data are presented in Table 10, and background ground-water data are presented in Table 11.

A summary of chemicals of interest in soil and ground water at the site is presented in Table 12.

6.2.2 Exposure Assessment

Exposure assessment is a multiple step procedure that entails characterization of the exposure setting, characterization of environmental fate and transport processes, identification of complete pathways of exposure, and quantification of exposure. A detailed description of the first two components are provided in Sections 4 and 7, respectively, of the RI Report (BB&L, 1993a). The other two Exposure Assessment components are discussed below. A number of potential receptors and exposure pathways were evaluated in the October 1993 RI Report. None of the evaluated exposure pathways were found to be complete.

6.2.2.1 Potential Receptors and Exposure Pathways

The following additional hypothetical future receptor groups were evaluated in this RA Addendum, as they were deemed potentially significant by the NYSDOH for the Bausch & Lomb site:

- On-site excavation workers; and
- On-site residents.

Hypothetical future exposures to site-related chemicals could occur among excavation workers if expansion and development of the facility were to occur. Although health and safety precautions would necessarily be employed, excavation workers could be exposed via surface and subsurface on-site soils by inhalation of airborne particulates and vapors. Dermal exposure could also occur, but as discussed in correspondence between Bausch & Lomb and the NYSDEC, will be insignificant in comparison with oral and inhalation exposures. Thus, dermal exposure is not evaluated quantitatively in this addendum.

While extremely unlikely, residential use of the undeveloped portion of the site could potentially occur at some time in the future. If a residential development were located on-site, then potential may exist for exposure to soil and ground water. The Town of Chili is supplied with municipal water by the Monroe County Water Authority (Town of Chili, 1992). Although it is unlikely that ground water will ever be used as a potable source, the remote possibility for future development exists. Therefore, to address this possibility, hypothetical ingestion of ground water is evaluated quantitatively for hypothetical future residents.

To summarize, potential exposure pathways evaluated in this RA Addendum are as follows:

1. Hypothetical Future Excavation Workers

   A. Inhalation of dusts from soil
   B. Inhalation of vapors from soil
   C. Inhalation of vapors from ground water

2. Hypothetical Future Residents

   A. Inhalation of dusts from soil
   B. Inhalation of vapors from soil
   C. Incidental ingestion of soil
   D. Dermal contact with soil
   C. Ingestion of ground water
   E. Dermal contact with ground water during bathing/showering
   F. Inhalation of organic vapors during bathing/showering.

6.2.2.2 Exposure Point Concentrations

An exposure point concentration is the concentration of a chemical of interest at a location where human exposure may occur. This value can be calculated on the basis of existing analytical data or through the use of predictive modeling. In this addendum, the exposure point concentrations for chemicals of interest in soil and ground water are based on the available analytical data. Concentrations for chemicals of interest released to air via dust and/or vapor are modeled from soil and ground-water concentrations.

The USEPA places emphasis on determining "Reasonable Maximum Exposure" (RME) and considers the upper 95 percent confidence limit on the arithmetic mean concentration (CL) to be appropriate for use in determining RME. The upper 95 percent CL for each chemical of interest in soil was calculated as described in Section 7 of the RI Report (BB&L, 1993a). As per USEPA (1989) guidance, the RME soil concentration is either the 95 percent CL or the maximum observed concentration in soil, whichever value is lower. The maximum observed concentration for each chemical of interest in ground water is used as the ground-water exposure concentrations, as per NYSDEC request (BB&L, April 6, 1994b).

When calculating the arithmetic mean concentrations, all detected soil concentrations were averaged, with one-half the sample quantitation limit (SQL) used as a proxy concentration for samples in which the compound was not detected (USEPA, 1989). For duplicate samples, the highest detected concentration (or one-half the higher detection limit for nondetects) was used in calculating the arithmetic mean for a given chemical.

Observed concentration ranges, frequencies of detection, arithmetic mean concentrations, and exposure concentrations for the chemicals of interest in ground water and soil are presented in Tables 13 and 14, respectively.

The use of soil and ground-water concentrations in predicting airborne chemical concentrations is discussed in Section 6.2.2.3 Inhalation of Dusts from Soil, Inhalation of Vapors from Soil, Inhalation of Vapors from Ground Water During Excavation, and Inhalation of Vapors from Ground Water During Showering.

6.2.2.3 Human Intakes

Human intakes over a long-term period of exposure, called chronic exposure, are calculated for each chemical of interest, receptor, and oral/dermal pathway of exposure, as appropriate. Since USEPA's reference toxicity values for chemical exposures via air (discussed in section 6.2.3) are reported in units of concentration, the air concentrations generated from soil and ground-water data are not used to generate human inhalation intakes. Instead, the air concentrations are multiplied by the fraction of time an individual would be exposed to these concentrations. Modified air exposure concentrations for excavation workers and residents are calculated as detailed in Tables 15 and 16, respectively.

Human intakes are expressed in units of milligrams per kilogram per day (mg/kg/day), and are calculated from exposure point concentrations and variables that account for contact rates, exposure frequency, exposure duration, body weights, absorption factors, and whether or not the chemical of interest is a carcinogen or noncarcinogen. In general, default exposure variables recommended by the USEPA are conservative, upper bound values, which, when taken together, result in overestimates of actual exposure. In this assessment, we have attempted to use site-specific variables where possible (e.g., exposure frequencies, certain exposure durations, body surface areas). Where defensible site-specific variables do not exist, USEPA default values were used for variables such as body weight, ingestion rates, and certain exposure durations. These details are presented in the following sections.

Inhalation of Dusts from Soil

Hypothetical future excavation workers and hypothetical future residents may be exposed to chemicals of interest in soils that are released to air via mechanical disturbances and wind erosion. In this assessment, worker and resident air exposure concentrations were determined from soil concentrations by multiplying the RME soil concentration by a particulate emission factor of 70 micrograms per cubic meter (ug/m^3) (Hawley, 1985), and adjusting the air concentration for exposure duration (as shown in Tables 15 and 16).

Hypothetical excavation workers are assumed to be adults who work on-site for 8 hours per day for 30 days over the course of one year. Hypothetical residents are assumed to be children who reside on-site 6 years and adults who reside on-site for 64 years, for a total residence time of 70 years. Residents are assumed to be exposed 24 hours per day, 350 days per year.

Inhalation of Vapors from Soil

Hypothetical future excavation workers and hypothetical future residents may be exposed to organic chemicals of interest in soils that volatilize to air. In this assessment, worker and resident air exposure concentrations were determined from RME soil concentrations using the modeling approach described in Appendix F. The estimated vapor concentrations are adjusted, based on exposure duration, to obtain air exposure concentrations (as detailed in Tables 15 and 16).

Hypothetical excavation workers are assumed to be adults who work on-site for 8 hours per day for 30 days over the course of one year. Hypothetical residents are assumed to be children who reside on-site 6 years and adults who reside on-site for 64 years, for a total residence time of 70 years. Residents are assumed to be exposed 24 hours per day, 350 days per year.

Inhalation of Vapors from Ground Water During Excavation

Hypothetical future excavation workers may be exposed to organic chemicals of interest in soils that volatilize to air from ground water encountered during an excavation job. In this assessment, vapor concentrations were determined from maximum observed ground-water concentrations using the modeling approach described in Appendix G. The estimated vapor concentrations are adjusted, based on exposure duration, to obtain air exposure concentrations (as detailed in Table 15).

Exposure to vapors released from ground water are estimated for the hypothetical trench excavation worker because: 1) this is the most potentially exposed individual; 2) other excavation activities do not require standing within a potentially confined space such as a trench for prolonged periods; and 3) the estimates derived for the hypothetical trench excavation worker are based on highly conservative assumptions and thus are overestimates of actual risk. As discussed previously with the NYSDEC (letter from Frank Chiappone to J. Andrew Fleck dated April 6, 1994b), construction of a utility trench is anticipated to require no more than one

8-hour day to complete. Although this assessment assumes that a worker will be exposed for one entire 8-hour work day to trench air concentrations derived from the maximum detected concentrations of constituents in site monitoring wells, actual exposure durations and concentrations are likely to be much less.

Incidental Ingestion of Soil

Hypothetical future residents could be exposed to site-related chemicals of interest through incidental ingestion of soils. These receptors are considered to be 15 kg children and 70 kg adults who reside on-site 350 days per year over a total lifetime of 70 years (6 child years and 64 adult years). As per USEPA (1991a) guidance, children and adults are assumed to ingest 200 mg and 100 mg of soil per day, respectively.

Soil ingestion exposure is quantified using the following equation developed by USEPA (1989):

$$\text{Intake (mg/kg/day)} = CS \times CF \times IR \times EF \times ED / (BW \times AT)$$

Where:

CS = chemical concentration in soil (mg/kg);
CF = conversion factor (10^{-6} mg/kg);
IR = ingestion rate (mg/day);
EF = exposure frequency (days/year);
ED = exposure duration (years);
BW = body weight (kg); and
AT = averaging time (days).

Values for the variables used in this equation are presented in Table 17.

Dermal Contact with Soil

The quantification of dermal absorption is a controversial subject within the scientific community and USEPA. Within USEPA, there are inter-regional policies on whether and how dermal exposure should be quantified. Since this assessment is being conducted in accordance with USEPA guidance and since the site is located within USEPA Region II, we have followed USEPA Region II policy regarding the quantification of dermal exposure.

Region II USEPA feels that sufficient data are available only to quantify dermal absorption of cadmium, PCBs (polychlorinated biphenyls), and polychlorinated dibenzo-p-dioxins from soil matrices. None of these compounds are chemicals of interest in soil at the Frame Center site. Thus, dermal exposure to chemicals in soil is not quantified for hypothetical future excavation workers or hypothetical future residents.

Ingestion of Drinking Water

As discussed previously, hypothetical ingestion of ground water by hypothetical future residents is evaluated in this Addendum. These individuals are considered to be 15 kg children who ingest one liter of water per day, 350 days per year, over a 6-year time period, and 70 kg adults who ingest 2 liters of water per day, 350 days per year, over a 64-year time period. As an additional conservative assumption, exposure concentrations at the tap are presumed equivalent to the maximum detected concentrations for the chemicals of interest currently detected in on-site monitoring wells.

Drinking water ingestion exposure is quantified using the following equation developed by USEPA (1989):

$$\text{Intake (mg/kg/day)} = CW \times IR \times EF \times ED \;/\; (BW \times AT)$$

Where:

CW	=	chemical concentration in monitoring wells (mg/liter);
IR	=	ingestion rate (liters/day);
EF	=	exposure frequency (days/year);
ED	=	exposure duration (years);
BW	=	body weight (kg); and
AT	=	averaging time (days).

Values for these variables are presented in Table 18.

Dermal Contact with Ground Water

As discussed previously, dermal contact with ground water used as a potable water source by hypothetical future residents is evaluated in this addendum. These individuals are considered to be 15 kg children who bath/shower once per day, 350 days per year, over a 6-year time period, and 70 kg adults who bath/shower once per day, 350 days per year, over a 64-year time period. As an additional conservative assumption, exposure concentrations at the tap are presumed equivalent to the maximum detected concentrations for the chemicals of interest currently detected in on-site monitoring wells.

Potable water dermal exposure is quantified using the following equation developed by USEPA (1989):

$$\text{Intake (mg/kg/day)} = DA \times SA \times EF \times ED \;/\; (BW \times AT)$$

Where:

DA = dermally exposed dose per event (mg/cm^2-event);

SA =	skin surface area contacting water (cm^2);
EF =	exposure frequency (events/year);
ED =	exposure duration (years);
BW =	body weight (kg); and
AT =	averaging time (days).

Dermally exposed dose (DA) was calculated separately for each chemical of interest in ground water. A detailed discussion of the approach used to derive the DA values is provided in Appendix H. Values for the other exposure variables used in the intake equation are presented in Table 18.

Inhalation of Vapors from Ground Water During Showering

Inhalation of vapors released during showering is evaluated for hypothetical future residents, assuming that ground water is used as the potable water source. In this assessment, bathroom vapor concentrations were determined from maximum detected ground-water concentrations using the modeling approach described in Appendix I. The estimated vapor concentrations are adjusted, based on exposure duration, to obtain air exposure concentrations (as detailed in Tables 16).

Hypothetical future residents are assumed to be children who reside on-site for 6 years and adults who reside on-site for 64 years, for a total residence time of 70 years. Residents are assumed to be exposed 0.2 hours per day, 350 days per year.

6.2.3 Toxicity Assessment

The toxicity assessment identifies and, when possible, quantifies the potential health effects associated with route-specific exposure to a given chemical. USEPA toxicity assessments and the resultant toxicity criteria are used in the human health evaluation to quantify both the carcinogenic and non-carcinogenic risks associated with each chemical of interest and route of exposure. USEPA toxicity criteria used in this assessment include: chronic reference dose (RfDs) (non-carcinogenic effects, oral exposure); chronic reference concentration (RfCs) (non-carcinogenic effects, inhalation exposure); carcinogenic slope factors (carcinogenic effects, oral exposure); and carcinogenic unit risk factors (carcinogenic effects, inhalation exposure).

The available USEPA RfDs, RfCs, unit risk factors, and carcinogenic slope factors used in this assessment are presented in Tables 19 and 20. Unless noted otherwise in these tables, these criteria were obtained from USEPA's Integrated Risk Information System (IRIS) data base. In the absence of values in IRIS, the USEPA (1994a) Health Effects Summary Tables (HEAST) were consulted for information.

Due to the lack of scientific studies to quantify dermal toxicity and carcinogenic potential for a vast majority of target compound list/target analyte list (TCL/TAL) constituents, no toxicity criteria for dermal exposure are currently available. In the absence of dermal reference toxicity criteria, the USEPA (1989) suggests that in some cases it may be possible to modify an oral reference toxicity value (RfD or slope factor) to reflect dermal absorption. This requires that both oral and dermal exposures result in the same toxic endpoints, and that quantitative estimates for both oral and dermal absorption of the chemical are available. This information is generally not available for most TCL/TAL constituents. As a consequence, any estimation of the contribution of the dermal exposure to overall risk needs to be viewed as highly tentative, at best.

6.2.4 Risk Characterization

The purpose of this section is to integrate information from the previous sections with USEPA reference toxicity values to characterize and quantify potential risks associated with exposure to soil and ground water.

6.2.4.1 Noncarcinogenic Risk

A hazard index (HI) approach is used to characterize the overall potential for noncarcinogenic effects associated with exposure to multiple chemicals. This approach assumes that simultaneous subthreshold chronic exposures to multiple chemicals are additive. The HI is calculated as follows:

$$HI = E1/Rf1 + E2/Rf2 + ...Ei/Rfi$$

where:

Ei = exposure intake or concentration for the i^{th} chemical;
Rfi = RfD (oral) or RfC (inhalation) for the i^{th} chemical; and
E/Rf = Hazard Quotient (HQ).

Calculation of a HI in excess of 1.0 indicates the potential for adverse health effects. HIs for each chemical of interest and significant pathway of exposure are presented in Tables 21A through 26A. The individual pathway HIs for each receptor population are summed to calculate a total HI. The total HIs for receptor populations are summarized below:

SUMMARY OF HAZARD INDICES FOR NON-CANCER RISKS

EXPOSURE PATHWAY	HYPOTHETICAL FUTURE RECEPTOR	
	Excavation Worker	Resident
SOIL		
Dust and vapor inhalation	4E - 08	9E - 07
Incidental ingestion	NA	8E - 03
Dermal contact	NA	NQ

SUMMARY OF HAZARD INDICES FOR NON-CANCER RISKS

EXPOSURE PATHWAY	HYPOTHETICAL FUTURE RECEPTOR	
	Excavation Worker	Resident
GROUND WATER		
Ingestion and dermal contact of potable water	NA	2E + 02
Vapor inhalation during showering	NA	2E - 01
Vapor inhalation during trench excavation		
TOTAL HAZARD INDEX	3E - 03	2E + 02

Notes:

NA - Not applicable
NQ - Not quantified

As shown above, the HI for hypothetical future excavation workers is well below 1.0, but the HI for hypothetical future residents is greater than 1.0. The predominant exposure pathways contributing to the HI for hypothetical future residents are ingestion and dermal contact with potable ground water. The total HI for hypothetical future resident exposure via potable ground-water pathways is approximately five orders of magnitude higher than the total HI for exposure via soil pathways. The excessive HI associated with hypothetical ground water use is due primarily to 1,2-dichloroethene, 1,1,1-trichloroethane, tetrachloroethane, and several inorganics.

6.2.4.2 Carcinogenic Risk

Carcinogenic risk is expressed as a probability of developing cancer as a result of lifetime exposure. For a given chemical and route of exposure, carcinogenic risk is calculated as follows:

$$\text{Risk} = \text{exposure intake} \times \text{SF}$$

where:

$$\text{SF} = \text{slope factor } (1/(\text{mg/kg/day})).$$

For exposure to multiple carcinogens, the USEPA assumes that the total risk is equivalent to the sum of the individual risks. USEPA's acceptable target range for carcinogenic risk associated with Superfund sites is less than one in ten thousand (10^{-4}) to one in one million (10^{-6}). Carcinogenic risks have been calculated in this RA for each chemical of interest and significant pathway of exposure. These risk calculations are presented in Tables 21B through 26B. Total cancer risks for each receptor population are summarized below:

SUMMARY OF EXCESS CANCER RISK

EXPOSURE PATHWAY	HYPOTHETICAL FUTURE RECEPTOR	
	Excavation Worker	Resident
<u>SOIL</u>		
Dust and vapor inhalation	1E - 12	3E - 09
Incidental ingestion	NA	8E - 05
Dermal contact	NA	NQ
<u>GROUND WATER</u>		
Ingestion and dermal contact of potable water	NA	2E - 01
Vapor inhalation during showering	NA	7E - 03
Vapor inhalation during trench excavation	5E - 09	NE
TOTAL CANCER RISK	5E - 09	2E - 01

<u>Notes:</u>

NA - Not applicable
NQ - Not quantified

As shown above, the total carcinogenic risk for hypothetical excavation workers is estimated to be 5E-09. This risk, which is well below USEPA's target risk range for Superfund sites, is due to dust and vapor inhalation during excavation activities.

The carcinogenic risk for hypothetical future residents who might utilize ground water as their potable water supply is 2E-01. This risk estimate is based on the currently detected maximum concentrations of chemicals in on-site monitoring wells and primarily reflects the presence of vinyl chloride in 3 of 61 ground-water samples. The total excess cancer risk for hypothetical future resident exposure via ground-water pathways is approximately four orders of magnitude higher than the total excess cancer risk for residential exposure via soil pathways.

6.2.4.3 Uncertainty

There are numerous sources of uncertainty in the risk calculations presented in this RA. The greatest uncertainties in this assessment concern potable use of ground water and the use of maximum detected ground-water concentrations to predict hypothetical risk. As with any risk assessment, it is important to bear in mind that the estimated risks are based on conservative assumptions and thus are likely overestimates of actual risk. Furthermore, the estimates of risk presented in this assessment are not predictors of disease outcome. They are tools to be used by risk managers to make decisions about remediation. A more detailed discussion of uncertainty in risk assessment is provided in Section 7 of the RI Report (BB&L, 1993a).

7.0 Discussion and Summary

The main objectives of the RI Addendum are outlined below, followed by a discussion of the RI Addendum findings:

Objective

- Locate, if possible, the source or sources of VOCs identified during the previous RI.

Discussion

- The sampling completed during the RI Addendum, as well as previous sampling events at the site, did not define a specific point source for the VOCs observed in soils and ground water at the site. This sampling has shown that the source or sources of the VOCs is apparently not a point source, but is rather a dispersed and diffused source area with no systematic distribution of constituents across the area. The lack of a well-defined point source is consistent with the hypothesis that the source of the VOCs was small-volume, random releases to the ground surface at one or more locations in one or more events.

  This conclusion is reinforced by the following observations:

  - Generally low levels of VOCs in the area of the shallow soil sampling;

  - Soil sample locations with non-detect levels of VOCs are intermixed with sample locations with detected VOCs; and

  - The chemical makeup of the detected VOCs varied radically between adjacent sampling locations, even taking into consideration the various chlorinated hydrocarbon degradation byproducts and a lack of a consistent pattern which would be indicative of a localized, single source release.

- Even though a well-defined source was not delineated during this investigation, generally higher levels of VOCs were observed in the area along the western perimeter of the shallow soil sampling area. This correlates with the observed elevated soil vapor VOC concentrations observed in this area during the RI.

Objective

- Delineate the extent of VOCs in ground water south and downgradient of monitoring well clusters BL-9, BL-10, and BL-11.

Discussion

- Shallow Overburden

  - Ground-water elevation contours developed during this investigation indicated that ground water that may contain VOCs in this area would generally flow to the southeast, with temporal and minor flow components to the northwest.

  - As shown on Figure 16, monitoring wells in the area shown to be downgradient (southeast) of the apparent source area, in the vicinity of monitoring wells BL-9S and BL-10S, contain ground water that does not have detectable concentration of VOCs, or contain only low concentrations of these compounds (less than 10 ppb).

  - Based on the RI Addendum results, the limits of the unconfined ground-water VOC plume southeast and downgradient of the apparent source area has been adequately defined.

- Overburden/Bedrock Interface

  - The potentiometric surface contours for this zone developed during this investigation indicated that ground water that may contain VOCs in the area south of monitoring well clusters BL-9, BL-10, and BL-11 would generally flow to the southeast and east.

  - Only monitoring wells BL-2D and BL-11D were observed to contain elevated concentrations of VOCs.

  - Ground water from monitoring wells downgradient of BL-2D and BL-11D do not contain detectable concentrations of VOCs, with the exception of one well, BL-13D, which had a total VOC concentration of one ppb.

  - Based on the RI Addendum results and as shown in Figure 17, the limits of the VOC plume in the overburden/bedrock interface zone have been adequately defined.

Objective

- Assess the nature and quality of surface soil in the topsoil piles south of Building 41.

Discussion

- Analysis of the eight site-specific metals from 16 discrete sample locations and two composite soil samples was completed. These concentrations are compared to site-specific background concentrations for these metals in Table 10. Based on this comparison, the following conclusions can be drawn:

  - The range of concentrations of metals in the topsoil piles are similar to the range of concentrations observed in the site-specific background samples.

- In several samples, the concentrations of some metals are above the concentration of background samples. In no case, however, do the concentrations of metals equal or exceed three times the observed background concentrations.

- The USEPA Hazard Ranking System (HRS) defines that a site-related release is assumed when the concentration of a metal is equal to or above three times the background concentration. Less than three times background is assumed by HRS to be representative of background concentrations.

- Given that the metal concentrations are below the HRS three-times criteria, the metals observed in the topsoil piles are not indicative of a site-related incident and are within the normal range of background concentrations.

Objective

- Further develop the site geologic and hydrogeologic characterization.

Discussion

- Ground-water elevation contours in both the shallow overburden and in the overburden/bedrock interface zones suggest that ground-water flow is generally to the southeast, with minor localized flow components to the southwest, north, and east. These observed flow patterns are consistent with the information generated during completion of the RI at this site.

- Up to 6 feet of seasonal fluctuation in ground-water elevations have been observed at the site. The fluctuations in ground-water elevations may contribute to the minor ground-water flow variations observed at the site, including localized mounds and depressions.

- The site is underlain by a heterogeneous mixture of glaciolacustrine and till units. A siltstone is present below the overburden material at depths ranging from approximately 19 to 35 feet. The upper portion of the siltstone is weathered.

- Horizontal gradients at the site vary from nearly non-existent in the center of the low ground-water mound near wells BL-2 and BL-11 to 0.3 ft/ft along the southern perimeter of the site between BL-9 and BL-13. Along the perimeter of the area, the gradients are similar in shallow overburden and at the overburden/bedrock interface zone. Ground-water flow velocities along the southern perimeter of the monitored area in the shallow overburden range from approximately 6.3 to 23.7 ft/yr. At the overburden/bedrock interface, the estimated ground-water velocities vary from approximately 45 to 63 ft/yr.

Objective

- Assess potential human health risks associated with exposure to on-site chemicals in the area south of Building 41 for the hypothetical exposures of an on-site excavation worker and an on-site resident.

Discussion

- Risks for a hypothetical excavation worker in this area were estimated to be well below the USEPA's carcinogenic target risk range of 1E-06 to 1E-4 applied to Superfund sites and well below the Hazard Index threshold of 1.0 for potential adverse health effects associated with noncarcinogenic constituents. NYSDOH does not recognize the concept of de minimus risk and hence, does not acknowledge USEPA's target risk ranges.

- The potential risks associated with hypothetical residential exposure to soil and ground water in this area were found to be above USEPA's target risks, indicating the possibility for adverse health effects or elevated potential for carcinogenic effects. These results, however, must be evaluated in light of the conservative nature of the assumptions used to develop this assessment:

  - The calculations were based on baseline, or unremediated, conditions in the ground water and soil at the site;

  - Residential properties which are not currently present would be developed in the area found to contain the highest level of site constituents;

  - Shallow overburden ground water would be utilized as a domestic water supply;

  - Concentrations used in the risk calculations represent maximum concentrations observed from across the site; and

  - The nature of the guidance used to develop the risk assessment is inherently conservative; for example, based on the guidance for ingestion of soil, a person would, over a 70-year lifetime, ingest more than 2.9 tons of the most contaminated soil on the site.

- Given the conservative nature of these assumptions, the potentially elevated risks associated with a hypothetical residential exposure scenario are exaggerated (e.g., assuming that exposure could occur even though such exposures do not currently occur; and using upper bound estimates of hypothetical contact rates, etc.). Utilizing a more rational approach, such as assuming that residential properties will not be located in the area of concern, or if they were developed at some time in the future the site would have undergone remediation, would result in a more practical assumption of risk.

Summary

This RI Addendum has addressed and satisfied each of the data gaps present in the October 1993 RI Report. During the Addendum investigation activities:

- The limits of the VOC plume were sufficiently identified southeast and downgradient of monitoring well clusters BL-9, BL-10, and BL-11;

- The nature and quality of the topsoil mounds south of the main Frame Center building were investigated and found to contain concentrations of the eight site-specific metals at concentrations comparable to background concentrations; and

- The risks associated with several additional exposure scenarios for the area south of Building 41 were evaluated.

The information developed during this and previous investigations have sufficiently characterized the area southeast of the facility and completion of the Feasibility Study is now warranted. Some additional characterization of ground-water quality in the area to the southwest of the facility may be required during completion of the Feasibility Study or during the Remedial Design.

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Tables

TABLES

TABLE 1

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

MONITORING WELL INVENTORY

Well Location	Screened Interval*	Unit(s) Monitored	Installation Date
BL-1	5-33.5	Overburden	1981
BL-2S	5.9-13.9	Overburden	1992
BL-2D	17.3-27.2	O/B	1992
BL-3	5-25	Overburden	1981
BL-4S	6.0-15.8	Overburden	1992
BL-4D	29.4-34.4	O/B	1990
BL-5S	9.5-14.5	Overburden	1990
BL-5D	23.4-28.4	O/B	1990
BL-6S	10.0-20.0	Overburden	1990
BL-6D	26.0-35.9	O/B	1992
BL-7	10.0-20.0	Overburden	1990
BL-8r	14.4-24.1	O/B	1994
BL-9S	5.9-15.8	Overburden	1992
BL-9D	30.0-34.6	Bedrock	1992
BL-10S	5.1-15.0	Overburden	1992
BL-10D	31.7-41.6	O/B	1992
BL-11S	5.9-14.9	Overburden	1992
BL-11D	18.0-27.9	O/B	1992
BL-12S	5.0-14.8	Overburden	1992
BL-13S	5.4-15.1	Overburden	1994
BL-13D	25.3-35.0	O/B	1994
BL-14S	16.0-24.0	Overburden	1994
BL-14D	31.6-39.6	O/B	1994
BL-15D	27.9-37.6	O/B	1994
BL-16S	4.4-14.1	Overburden	1994
SS-1	9.0-14.0	Overburden	1990
SS-2	5.1-15.1	Overburden	1992
SS-3	3.8-13.8	Overburden	1992

Notes:

* = Depths are measured in feet and referenced from ground surface.
O/B = Well screen straddles overburden/bedrock interface.

TABLE 2

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK

REMEDIAL INVESTIGATION ADDENDUM REPORT

GROUND-WATER & SURFACE-WATER ELEVATIONS

Location	Reference Point Elevation	Water Elevations (Feet)							
		10/23/90	12/10/90	01/08/91	03/20/92	04/06/92	07/13/92	04/10/94	07/12/94
BL-1	552.52	549.55	549.81	549.97	550.33	550.17	548.02	550.12	547.88
BL-2	548.19	542.87	544.17	544.04	WD	WD	WD	WD	WD
BL-2S	548.65	--	--	--	545.35	545.14	541.18	545.87	542.50
BL-2D	548.11	--	--	--	543.62	543.75	540.56	544.32	541.07
BL-3	549.73	541.87	542.61	542.51	543.62	543.15	540.98	544.13	541.74
BL-4S	546.77	--	--	--	543.77	543.29	540.78	544.16	541.02
BL-4D	546.93	541.93	543.25	543.20	543.54	543.69	540.73	544.21	540.73
BL-5S	546.12	542.08	542.04	542.36	539.45	540.91	541.19	542.75	540.90
BL-5D	546.10	541.97	543.32	543.22	543.57	543.68	540.76	544.24	540.16
BL-6S	548.62	542.94	543.87	543.88	544.67	544.37	541.68	544.67	540.95
BL-6D	548.77	--	--	--	543.55	543.69	540.77	543.89	539.67
BL-7	548.37	542.25	543.72	543.74	NA	544.28	540.66	545.16	540.32
BL-8	543.75	541.90	543.07	543.23	543.47	543.70	540.57	WD	WD
BL-8r	544.03	--	--	--	--	--	--	543.70	541.06
BL-9S	545.18	--	--	--	543.28	543.05	539.49	543.38	539.17
BL-9D	545.39	--	--	--	543.64	543.78	540.53	544.30	541.04
BL-10S	547.16	--	--	--	543.99	543.67	539.69	544.17	539.32
BL-10D	547.21	--	--	--	543.73	543.81	540.42	544.38	541.12
BL-11S	548.74	--	--	--	545.57	545.24	540.64	546.12	540.43
BL-11D	548.90	--	--	--	543.72	543.90	540.57	544.72	540.90
BL-12S	549.11	--	--	--	544.40	543.82	541.56	544.72	541.29
BL-13S	541.20	--	--	--	--	--	--	535.87	533.19
BL-13D	541.05	--	--	--	--	--	--	536.38	533.73
BL-14S	542.12	--	--	--	--	--	--	540.43	539.11
BL-14D	542.44	--	--	--	--	--	--	537.67	537.59
BL-15D	546.12	--	--	--	--	--	--	544.36	540.44
BL-16S	544.53	--	--	--	--	--	--	542.25	540.66
SS-1	545.90	542.31	543.60	544.25	544.52	544.49	540.80	544.50	540.35
SS-2	536.17	--	--	--	527.44	527.26*	526.25	527.97	527.29
SS-3	532.97	--	--	--	525.58	525.41*	523.58	526.17	523.92
GP-2	527.71	--	--	--	--	526.29*	526.49	526.51	526.46
GP-3	526.43	--	--	--	--	524.77*	524.90	524.73	524.86

Notes:

All elevations are referenced to National Geodetic Vertical Datum (NGVD).
-- = Data not available. Monitoring well or gauging point installed on a later date.
WD = Monitoring well BL-2 was decommissioned on March 9, 1992. Monitoring well BL-8 was decommissioned on March 25, 1994.
NA = Water level not obtained due to seized well cap.
* = Water level measurement taken on April 10, 1992.

TABLE 3

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK

REMEDIAL INVESTIGATION ADDENDUM REPORT

IN-SITU HYDRAULIC CONDUCTIVITY RESULTS

Well I.D.	(Bouwer Rice) cm/sec
BL-1	1.4×10^{-4}
BL-2S	3.3×10^{-4}
BL-2D	8.1×10^{-4}
BL-3	1.9×10^{-4}
BL-4S	1.2×10^{-4}
BL-4D	1.5×10^{-2}
BL-5S	6.4×10^{-5}
BL-5D	1.4×10^{-2}
BL-6S	1.9×10^{-4}
BL-6D	3.6×10^{-3}
BL-7	1.7×10^{-4}
BL-8r	8.6×10^{-5}
BL-9S	2.5×10^{-4}
BL-9D	4.1×10^{-3}
BL-10S	5.6×10^{-4}
BL-10D	1.6×10^{-3}
BL-11S	3.3×10^{-4}
BL-11D	5.0×10^{-3}
BL-12S	2.1×10^{-5}
BL-13S	2.4×10^{-4}
BL-13D	4.9×10^{-5}
BL-14S	2.1×10^{-5}
BL-14D	1.8×10^{-4}
BL-15D	1.1×10^{-3}
BL-16S	4.3×10^{-5}
SS-1	1.5×10^{-4}
SS-2	1.2×10^{-4}
SS-3	9.9×10^{-5}

TABLE 4

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK

REMEDIAL INVESTIGATION ADDENDUM REPORT

VERTICAL GRADIENTS AT MONITORING WELL CLUSTERS

		April 10, 1994			July 12, 1994		
Well	Mid-pt. Screen	Ground-Water Elevation (ft)	Gradient (ft/ft)	Gradient Direction	Ground-Water Elevation (ft)	Gradient (ft/ft)	Gradient Direction
BL-2S	537.0	545.87			542.50		
BL-2D	542.2	544.32	0.298	down	541.07	0.275	down
BL-4S	536.2	544.16			541.02		
BL-4D	515.0	544.21	0.002	up	540.73	0.014	down
BL-5S	534.3	542.75			540.9		
BL-5D	520.5	544.24	0.108	up	540.16	0.054	down
BL-6S	534.1	544.67			540.95		
BL-6D	518.0	543.89	0.048	down	539.67	0.079	down
BL-9S	532.6	543.38			539.17		
BL-9D	511.0	544.30	0.043	up	541.04	0.087	up
BL-10S	535.1	544.17			539.32		
BL-10D	508.9	544.38	0.008	up	541.12	0.069	up
BL-11S	536.2	546.12			540.43		
BL-11D	524.1	544.72	0.116	down	540.9	0.039	up
BL-13S	528.5	535.87			533.19		
BL-13D		536.38	0.026	up	533.73	0.028	up
BL-14S	520.5	540.43			539.11		
BL-14D	505.1	537.67	0.179	down	537.59	0.099	down

TABLE 5
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SHALLOW SOIL SAMPLING AREA
SAMPLE ANALYTICAL RESULTS
DETECTED VOLATILE ORGANIC COMPOUNDS
FEBRUARY AND MARCH 1994

Sample Date	50,100 2/28/94	25,75 2/28/94	25,100 2/28/94	25,125 2/28/94	0,75 3/23/94	0,75* 2/28/94	0,100 2/28/94	0,150 2/28/94	0,225 3/11/94	0,225* 3/11/94	0,250 3/23/94	−25,0 2/28/94	−25,25 2/28/94	−25,50 2/28/94	−25,100 2/28/94
1,2−DICHLOROETHYLENE (TOTAL)	<0.001	**0.016**	**0.040**	<0.001	**0.03**	<0.001	**0.200**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.069**
ETHYLBENZENE	**0.150 V**	<0.002	<0.003	<0.001	**0.03**	<0.001	<0.002	<0.001	**0.001**	**0.001**	**0.071**	<0.001	**0.001**	<0.001	<0.002
1,1,2−TRICHLOROETHANE	<0.001	<0.002	<0.003	<0.001	<0.001	<0.001	**0.004#**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.016
TRICHLOROETHYLENE	<0.001	**0.060**	**0.051**	<0.001	**0.015**	**0.011**	**0.180**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.190**
FREON 113	<0.001	<0.002	<0.003	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.003 V**

Sample Date	−25,150 2/28/94	−25,175 2/28/94	−25,200 2/28/94	−25,225 3/11/94	−25,250 3/23/94	−50,0 2/28/94	−50,50 2/28/94	−50,75 2/28/94	−50,125 2/28/94	−50,150 2/28/94	−50,175 2/28/94	−50,200 2/28/94	−50,225 3/11/94	−75,0 2/28/94
1,2−DICHLOROETHYLENE (TOTAL)	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	**0.032**	<0.001	**0.002**	**0.001 V**	<0.001	<0.002
DICHLOROMETHANE	<0.002	<0.001	<0.001	**0.004**	**0.003**	<0.002	<0.001	<0.001	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002
ETHYLBENZENE	<0.002	<0.001	**0.011**	<0.001	<0.001	<0.002	**0.006**	**0.078**	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002
TRICHLOROETHYLENE	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	**0.110**	**0.020**	**0.006**	<0.001	<0.001	<0.002
TRICHLOROFLUOROMETHANE	<0.002	<0.001	<0.001	**0.006**	<0.001	<0.002	<0.001	<0.001	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002
XYLENE (TOTAL)	<0.005	<0.004	<0.004	<0.004	<0.004	<0.005	<0.004	<0.004	<0.005	<0.004	<0.005	**0.004**	<0.004	<0.005

Sample Date	−75,25 2/28/94	−75,50 2/28/94	−75,50* 2/28/94	−75,100 2/28/94	−75,150 2/28/94	−75,175 2/28/94	−75,225 3/11/94	−100,0 2/28/94	−100,25 2/28/94	−100,75 2/28/94	−100,125 2/28/94	−100,150 2/28/94	−100,175 2/28/94	−100,200 2/28/94
1,2−DICHLOROETHYLENE (TOTAL)	<0.002	<0.001	<0.001	<0.001	**0.012**	**0.006**	<0.001	<0.001	<0.001	<0.001	<0.001	**0.005**	**0.028**	<0.002
ETHYLBENZENE	**0.003**	<0.001	**0.018**	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.007	<0.002
TRICHLOROETHYLENE	<0.002	<0.001	<0.001	<0.001	**0.050**	**0.021**	<0.001	<0.001	<0.001	<0.001	<0.001	**0.010**	**0.220**	<0.002

Sample Date	−125,125 3/11/94	−125,150 3/11/94	−125,175 3/11/94	−125,200 3/11/94	−125,225 3/11/94	−150,150 3/11/94	−150,175 3/11/94	−150,200 3/11/94	−150,225 3/11/94	EQUIP. BLANK 2/28/94	EQUIP. BLANK 2/28/94	EQUIP. BLANK 3/11/94	QC BLANK 2/28/94	QC BLANK 3/11/94
1,2−DICHLOROETHYLENE (TOTAL)	<0.002	<0.001	<0.002	<0.001	**0.003**	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001
DICHLOROMETHANE	<0.002	<0.001	<0.002	<0.001	<0.001	<0.001	**0.001**	**0.003**	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001
TRICHLOROETHYLENE	<0.002	<0.001	<0.002	**0.007 V**	**0.007**	<0.001	<0.001	**0.004**	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001
TRICHLOROFLUOROMETHANE	<0.002	<0.001	<0.002	**0.012 V**	<0.001	**0.016 V**	**0.011**	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001

Notes:
All concentrations reported in mg/kg (ppm).
< − Less than.
* − Duplicate sample.
# − The value reported for 1,1,2−Trichloromethane may represent 1,1,2− Trichloroethane, Dibromochloromethane, trans−1,3−Dichloropropylene or any combination of the three compounds.
V − Indicates that value is estimated.
Shaded/bolded values designate concentrations that exceeded detection limits.

TABLE 6
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SOIL BORING SAMPLE ANALYTICAL RESULTS
DETECTED VOLATILE ORGANIC COMPOUNDS
MARCH 1994

Sample Depth (ft.) Date	B-4 (10-12) 3/21/94	B-4 (12-14) 3/21/94	BL-13S (10-12) 3/21/94	BL-13D (26-28) 3/18/94	BL-14S (18-20) 3/23/94	BL-14D (34-36) 3/22/94	BL-15D (30-32) 3/17/94	BL-15D* (30-32) 3/17/94	EQUIP. BLANK 3/17/94	QC BLANK 3/17/94	QC BLANK 3/18/94	QC BLANK 3/21/94	QC BLANK 3/23/94
1,2-DICHLOROETHYLENE (TOTAL)	<0.006	<0.006	<0.001	**0.004**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TOLUENE	<0.006	<0.006	<0.001	**0.001**	<0.001	<0.001	**0.002**	**0.004**	<0.001	<0.001	<0.001	<0.001	<0.001
TRICHLOROETHYLENE	**0.082**	**0.082**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Notes:
All concentrations reported in mg/kg (ppm).
< - Less than.
(10-12) - Indicates depth in feet below ground surface.
* - Duplicate sample.
Shaded/bolded values designate that concentration exceeded detection limit.

TABLE 7
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

TOPSOIL PILE SAMPLING AREA
SAMPLE ANALYTICAL RESULTS
DETECTED VOLATILE ORGANIC COMPOUNDS
MARCH 1994

Sample	P1–1	P1–1*	P1–2	P1–4	P1–5	P1–7	P1–8	P1–10	P1–11	P2–1
Date	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94
CHLOROFORM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
DICHLOROMETHANE	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Sample	P2–2	P2–4	P2–5	P2–7	P2–8	P2–10	P2–11	EQUIP. BLANK	QC TRIP BLANK
Date	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94
CHLOROFORM	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.006**	<0.001
DICHLOROMETHANE	<0.001	**0.001**	<0.001	<0.001	**0.001**	**0.002**	<0.001	<0.001	<0.001

Notes:

All concentrations reported in mg/kg (ppm) except equipment blank and QC blank which are reported in mg/L (ppm).
< – Less than.
* – Duplicate sample.
R – Analysis for this compound rejected during data validation.
V – Indicates that value is estimated.
Shaded/bolded values designate that concentration exceeded detection limit.

TABLE 8
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

TOPSOIL PILE SAMPLES
SAMPLE ANALYTICAL SUMMARY
TOTAL INORGANICS
MARCH 1994

Sample	COMP P1	P1-1	P1-1*	P1-2	P1-4	P1-5	P1-7	P1-8	P1-10	P1-11
Date	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94
CADMIUM	0.52U	0.47U	0.61BV	0.51U	1.2BV	0.49U	0.48U	0.50U	0.47U	0.59BV
CHROMIUM	16.6V	15.8V	26.8V	25.7V	14.3V	14.3V	14.5V	14.7V	12.6V	12.7V
LEAD	14.6V	13.2V	19.0V	5.1UV	24.9V	18.5V	21.0V	17.7V	8.6V	14.3V
MERCURY	0.13U	0.12U	0.13U	0.13U	0.14U	0.12U	0.12U	0.12U	0.12U	0.12U
NICKEL	14.6	16.0	29.6	28.6	12.7	11.6	10.3	11.4	10.0	9.3B
SILVER	0.90BV	2.3BV	1.3BV	0.76UV	0.81UV	1.00BV	1.4BV	1.4BV	1.5BV	0.73BV
VANADIUM	21.0	25.1	34.6	33.1	22.4	22.5	19.9	22.2	21.4	19.9
ZINC	43.9	37.9	60.8	60.0	46.2	43.9	43.7	47.1	35.4	35.2

Sample	COMP 2	P2-1	P2-2	P2-4	P2-5	P2-7	P2-8	P2-10	P2-11	EQUIP. BLANK
Date	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94	4/1/94
CADMIUM	0.74BV	0.51U	0.53U	0.61B	0.49U	0.74BV	1.1BV	0.51U	0.51U	2.0U
CHROMIUM	16.2V	20.1V	25.8V	9.0V	14.4V	9.7V	16.1V	17.0V	11.9V	2.8BV
LEAD	14.4V	14.7V	14.9V	21.0V	15.9V	14.6V	17.6V	21.9V	15.3V	20.0UV
MERCURY	0.13U	0.13U	0.13U	0.12U	0.12U	0.12U	0.12U	0.13U	0.13U	0.20U
NICKEL	14.5	18.1	19.0	6.4B	14.5	7.7B	16.7	14.0	9.8B	9.0U
SILVER	0.76UV	0.95BV	0.89BV	0.77BV	0.97BV	1.1BV	0.93BV	0.77UV	0.76UV	3.0UV
VANADIUM	23.8	28.6	35.1	15.5	19.7	16.2	32.1	24.5	19.4	4.0U
ZINC	48.6	49.5	72.3	33.0	44.7	32.8	43.3	52.1	34.7	8.1B

Notes:

All concentrations reported in mg/kg (ppm), except equipment blanks which are in ug/L (ppb).
U – The compound was analyzed for but not detected.
B – The reported value is greater than or equal to the instrument detection limit, but less than the contract required detection limit.
* – Duplicate sample.
V – Indicates that value is estimated.
Shaded/bolded values designate that concentration exceeded detection limit.

TABLE 9
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

GROUND-WATER SAMPLE ANALYTICAL SUMMARY
DETECTED VOLATILE ORGANIC COMPOUNDS
APRIL 1994

Sample	BL-1	BL-2S	BL-2D	BL-3	BL-4S	BL-4D	BL-5S	BL-5D	BL-5D*	BL-6S	BL-6S*	BL-6D	BL-7	BL-8r
Date	4/12/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/12/94	4/12/94
BENZENE	<1	<1	**1**	<1	<1	<1	<1	<1	<1	<10	<10	<1	**81**	<1
1,1-DICHLOROETHANE	<1	<1	**2**	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,2-DICHLOROETHYLENE (TOTAL)	<1	<1	**2**	<1	<1	<1	<1	<1	<1	**38**	**34**	<1	<10	<1
TETRACHLOROETHYLENE	**1**	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,1,1-TRICHLOROETHANE	<1	<1	**1**	**7**	<1	<1	<1	<1	<1	<10	<10	<1	**54**	<1
TRICHLOROETHYLENE	<1	<1	**34**	<1	**23**	<1	<1	<1	<1	**420**	**380**	<1	**94**	<1
FREON 113	<1	**2**	**57**	<1	**28**	<1	<1	**1**	<1	**38**	**34**	<1	**490**	<1

Sample	BL-9S	BL-9D	BL-10S	BL-10D	BL-11S	BL-11D	BL-12S	BL-13S	BL-13D	BL-14S	BL-14D	BL-15D	BL-16S	EQUIP BLANK I	EQUIP BLANK II	QC TRIP BLANK	QC TRIP BLANK
Date	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/12/94	4/12/94	4/12/94	4/12/94	4/12/94	4/12/94	4/11/94	4/12/94	4/11/94	4/12/94
BENZENE	<100	<1	<10	<1	<1	<100	**2**	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
DICHLORODIFLUOROMETHANE	#	<10	<100	<10	<10	<1000	<10	#	<10	<10	<10	<10	<10000	<10	<10	<10	<10
1,1-DICHLOROETHANE	<100	<1	<10	<1	<1	<100	**1**	<1	<1	**1**	<1	<1	<1000	<1	<1	<1	<1
1,2-DICHLOROETHYLENE (TOTAL)	**1700**	<1	<10	<1	**1**	**1200**	<1	<1	**1**	<1	<1	<1	<1000	<1	<1	<1	<1
DICHLOROMETHANE	<100	<1	<10	<1	<1	**100**	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
TETRACHLOROETHYLENE	<100	<1	**460**	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
1,1,1-TRICHLOROETHANE	<100	<1	<10	<1	<1	**2600**	**3**	<1	<1	**2**	<1	<1	**11000**	<1	<1	<1	<1
TRICHLOROETHYLENE	<100	<1	<10	<1	**1**	**6100**	**1**	<1	<1	**1**	<1	<1	**62000**	<1	<1	<1	<1
VINYL CHLORIDE	**710#**	<1	<10	<1	<1	<100	<1	**2#**	<1	<1	<1	<1	<1000	<1	<1	<1	<1
FREON 113	<100	<1	<10	<1	<1	**1100**	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1

Notes:

All concentrations reported in ug/L (ppb).
< – Less than.
= The value reported for vinyl chloride may represent vinyl chloride , dichlorodifluoromethane, or any combination of the two compounds.
* – Duplicate sample.
Shaded/bolded values designate that concentration exceeded detection limit.

TABLE 10

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK

REMEDIAL INVESTIGATION ADDENDUM REPORT

SUMMARY OF TOPSOIL PILE AND BACKGROUND METALS CONCENTRATIONS

Metal	Topsoil Pile Range of Concentrations	Site Specific Background Samples Range of Concentrations	3 x Background Concentration
Cadmium	<0.47–1.2	<0.216–0.49	1.47
Chromium	9.0 – 26.8	9.55–27.1	81.3
Lead	<5.1–24.9	0.05–19.6	58.8
Nickel	6.4–29.6	6.72–22.5	67.5
Silver	<0.76–2.3	<0.71–0.91	2.73
Vanadium	15.5–35.1	16.8–40.7	122.1
Zinc	32.8–72.3	31.7–195	585

Note:

All concentrations reported in parts per million.

TABLE 11

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

COMPARISON OF INORGANIC GROUND-WATER DATA TO BACKGROUND DATA

	Range of Ground Water Concentrations (mg/l)	Frequency of Detection	Maximum Detected Background Concentration (mg/l)	3x Background (mg/l)	Does Maximum Detected Concentration Exceed 3x Background?
Aluminum	0.239 – 24.1	11 / 11	3.07	9.21	YES
Arsenic	ND – 0.004	7 / 18	0.0034	0.0102	NO
Barium	0.033 – 0.277	11 / 11	0.305	0.915	NO
Beryllium	ND – 0.003	2 / 11	ND	–	YES*
Cadmium	ND – 0.004	7 / 25	ND	–	YES*
Chromium	ND – 0.161	16 / 32	0.007	0.021	YES
Cobalt	ND – 0.016	2 / 11	ND	–	YES*
Copper	ND – 0.133	4 / 11	0.016	0.048	YES
Iron	0.201 – 40.9	11 / 11	2.54	7.62	YES
Lead	ND – 0.133	19 / 32	0.0023	0.0069	YES
Manganese	0.022 – 1.44	11 / 11	0.185	0.555	YES
Nickel	ND – 0.115	5 / 25	ND	–	YES*
Selenium	ND – 6.31	1 / 11	ND	–	YES*
Silver	ND – 0.006	14 / 25	ND	–	YES*
Vanadium	ND – 0.162	21 / 25	0.007	0.021	YES
Zinc	ND – 0.651	17 / 25	0.014	0.042	YES

Notes:

ND = Not Detected.
* Metal detected in ground water, but was not detected in background samples.
Groundwater samples BL-1 collected in 1990 and 1991 are background samples.

TABLE 12

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

CHEMICALS OF INTEREST

GROUND WATER	SOIL
VOLATILE ORGANICS	VOLATILE ORGANICS
Acetone	1,2–Dichloroethene
Benzene	Ethylbenzene
2–Butanone	Freon 113
1,1–Dichloroethane	Methylene chloride
1,1–Dichloroethene	Toluene
1,1–Dichloroethene	1,1,1–Trichloroethane
Freon 113	1,1,2–Trichloroethane
Methylene chloride	Trichloroethene
Tetrachloroethene	Trichlorofluoromethane
Toluene	Xylenes
1,1,1–Trichloroethane	SEMIVOLATILE ORGANICS
Trichloroethene	Acenaphthene
Vinyl chloride	Anthracene
SEMIVOLATILE ORGANICS	Benzo(a)anthracene
Bis(2–ethylhexyl)phthalate	Benzo(a)pyrene
Diethylphthalate	Benzo(b)fluoranthene
Di–n–butylphthalate	Benzo(g,h,i)perylene
2–Methylphenol	Benzo(k)fluoranthene
4–Methylphenol	Chrysene
INORGANICS	Dibenz(a,h)anthracene
Aluminum	Dibenzofuran
Beryllium	Diethylphthalate
Cadmium	Di–n–butylphthalate
Chromium	Fluoranthene
Cobalt	Fluorene
Copper	Indeno(1,2,3–c,d)pyrene
Iron	2–Methylnaphthalene
Lead	Naphthalene
Manganese	Phenanthrene
Nickel	Pyrene
Selenium	
Silver	
Vanadium	
Zinc	

TABLE 13

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

EXPOSURE POINT CONCENTRATIONS FOR GROUND WATER

	Range of Ground Water Concentrations (mg/l)	Frequency of Detection	Maximum Detected Concentration (mg/l)
<u>VOLATILE ORGANICS</u>			
Acetone	ND – 0.01	4 / 18	0.01
Benzene	ND – 0.092	10 / 16	0.092
2–Butanone	ND – 0.002	4 / 18	0.002
1,1–Dichloroethane	ND – 0.023	9 / 61	0.023
1,1–Dichloroethene	ND – 0.009	4 / 61	0.009
1,2–Dichloroethene	ND – 7.9	18 / 61	7.9
Freon 113	ND – 1.1	12 / 43	1.1
Methylene Chloride	ND – 0.10	1 / 61	0.1
Tetrachloroethene	ND – 0.46	6 / 61	0.46
Toluene	ND – 0.017	7 / 61	0.017
1,1,1–Trichloroethane	ND – 11	16 / 61	11
Trichloroethene	ND – 62	23 / 61	62
Vinyl chloride	ND – 3.6	3 / 61	3.6
<u>SEMIVOLATILE ORGANICS</u>			
2–Methylphenol	ND – 0.004	1 / 13	0.004
4–Methylphenol	ND – 0.002	1 / 13	0.002
Diethylphthalate	ND – 0.14	5 / 13	0.14
Di–n–butylphthalate	ND – 0.003	2 / 13	0.003
Bis(2–ethylhexyl)phthalate	ND – 0.001	1 / 13	0.001
<u>INORGANICS</u>			
Aluminum	0.239 – 24.1	11 / 11	24.1
Beryllium	ND – 0.003	2 / 11	0.003
Cadmium	ND – 0.004	7 / 25	0.004
Chromium	ND – 0.161	16 / 32	0.161
Cobalt	ND – 0.016	2 / 11	0.016
Copper	ND – 0.133	4 / 11	0.133
Iron	0.201 – 40.9	11 / 11	40.9
Lead	ND – 0.133	19 / 32	0.133
Manganese	0.022 – 1.44	11 / 11	1.44
Nickel	ND – 0.115	5 / 25	0.115
Selenium	ND – 6.31	1 / 11	6.31
Silver	ND – 0.006	14 / 25	0.006
Vanadium	ND – 0.162	21 / 25	0.162
Zinc	ND – 0.651	17 / 25	0.651

<u>**Notes:**</u>

ND = Not Detected.

TABLE 14

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

EXPOSURE POINT CONCENTRATIONS FOR SOIL

Chemical	Range of Soil Concentrations (ug/kg)	Frequency of Detection	Arithmatic Mean Concentration (ug/kg)	95% Upper Bound Concentration (ug/kg)	RME[2] Concentration (ug/kg)
Volatile Organic Compounds					
1,2-Dichloroethene	ND - 280	19 / 72	10.8	20.2	20.2
Methylene Chloride	ND - 4	8 / 72	0.9	1.1	1.1
Ethylbenzene	ND - 150	11 / 72	5.5	10.5	10.5
Toluene	ND - 400	4 / 72	6.3	17.3	17.3
1,1,1-Trichloroethane	ND - 1	1 / 72	0.7	0.8	0.8
1,1,2-Trichloroethane	ND - 4	1 / 72	0.9	1.1	1.1
Trichloroethene	ND - 1200	19 / 72	33.9	68.5	68.5
Trichlorofluoromethane	ND - 16	4 / 72	1.3	1.9	1.9
Freon 113	ND - 3	2 / 72	0.8	0.9	0.9
Xylenes	ND - 310	2 / 72	6.6	15.1	15.1
Semivolatile Organic Compounds					
Naphthalene	ND - 980	2 / 7	560.7	1179	980
2-Methylnaphthalene	ND - 1100	3 / 7	315.9	622	622
Acenaphthene	ND - 2200	2 / 7	789.3	1582	1582
Dibenzofuran	ND - 820	2 / 7	533.6	1143	820
Diethylphthlate	ND - 60 [1]	2 / 7	407.9	1031	60
Fluorene	ND - 1800	2 / 7	707.9	1427	1427
Phenanthrene	ND - 16000	2 / 7	3049.3	8018	8018
Anthracene	ND - 3000	2 / 7	927.9	1908	1908
Di-n-butylphthalate	ND - 81 [1]	2 / 7	411.7	1033	81
Fluoranthene	ND - 19000	2 / 7	3563.6	9482	9482
Pyrene	ND - 15000	2 / 7	2977.9	7627	7627
Benzo(a)anthracene	ND - 8500	2 / 7	1835.0	4441	4441
Chrysene	ND - 5100	2 / 7	1306.4	2873	2873
Benzo(b)fluoranthene	ND - 9500	2 / 7	2035.0	4951	4951
Benzo(k)fluoranthene	ND - 2200	2 / 7	805.0	1595	1595
Benzo(a)pyrene	ND - 4900	2 / 7	1277.9	2786	2786
Indeno(1,2,3-cd)pyrene	ND - 3000	2 / 7	915.0	1898	1898
Dibenzo(a,h)anthracene	ND - 700	2 / 7	517.9	1121	700
Benzo(g,h,i)perylene	ND - 3100	2 / 7	929.3	1938	1938

Notes:

[1] Maximum concentration is lower than the average detection limit. Therefore, the arithmatic mean and upper-bound concentrations (listed above) exceed the maximum detected concentration because one-half the detection limit was used to calculate these values.

Includes shallow soil samples and topsoil pile samples from March 1994 sampling, and test pit samples from 1992.

Duplicate samples were combined by using the highest detected concentration of the two samples or one-half the highest detection limit if chemical concentration in both samples were ND.

[2] RME = Reasonable Maximum Exposure per USEPA (1989) guidance, the RME concentration is the lesser of the 95% upper bound concentration and the maximum detected concentration.

ND = Not Detected

TABLE 15

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

CALCULATION OF MODIFIED AIR CONCENTRATIONS

HYPOTHETICAL FUTURE EXCAVATION WORKER

Air concentration is adjusted over the duration of exposure using the following equations:

For non-carcinogens,

$$Ca\ (ug/m^3) = (Cd\ or\ Cv) \times ET \times ED$$

Where:	Ca	=	modified air concentration
	Cd	=	dust concentration (ug/m^3); where Cd = Cs x PEF
	Cv	=	vapor concentration (ug/m^3)
	Cs	=	RME soil concentration (ug/kg)
	PEF	=	Hawley (1985) Particulate Emission Factor = 7E-08 kg dust/m^3
	ET	=	Exposure Time = 8 hours/24 hours
	ED	=	Exposure Duration = 30 days/365 days or 1 day/1 day for trench excavation

For carcinogens,

$$Ca\ (ug/m^3) = (Cd\ or\ Cv) \times ET \times ED$$

Where:	Variables are identical to those above except:		
	ED	=	Exposure Duration = 30 days/25,550 days or 1 day/25,550 days for trench excavation (25,550 days in a 70 year lifespan)

TABLE 16

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

CALCULATION OF MODIFIED AIR CONCENTRATIONS

HYPOTHETICAL FUTURE RESIDENTS

Air concentration is adjusted over the duration of exposure using the following equations:			
For non-carcinogens, $Ca\ (ug/m^3) = (Cd\ or\ Cv) \times ET \times ED$			
Where:	Ca	=	modified air concentration
	Cd	=	dust concentration (ug/m^3); where Cd = Cs x PEF
	Cv	=	vapor concentration (ug/m^3)
	Cs	=	RME soil concentration (ug/kg)
	PEF	=	Hawley (1985) Particulate Emission Factor = 7E-08 kg dust/m^3
	ET	=	Exposure Time = 24 hours/24 hours for soil vapor or soil dust, and 0.2 hours/24 hours for shower vapor
	ED[1]	=	Exposure Duration = 2,100 days/2,190 days - child; 22,400 days/23,360 days - adult
For carcinogens, $Ca\ (ug/m^3) = (Cd\ or\ Cv) \times ET \times ED$			
Where:	Variables are identical to those above except:		
	ED	=	Exposure Duration = 2,100 days/25,550 days - child; 22,400 days/25,550 days - adult (25,550 days in a 70 year lifespan)

Notes:

1 adjusts for 350/365 days per year exposure over a 6-year period for a child, and a 64-year period for an adult.

TABLE 17

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

EXPOSURE FACTORS: EXPOSURE TO SOIL

HYPOTHETICAL FUTURE RESIDENTS

FACTOR	VALUE	REFERENCE
Data set	On-site shallow soil	
Duration of Exposure	6 years - child 64 years - adult	c
Frequency of event	350 days/year	b
Averaging time carcinogens: non-carcinogens:	 25,550 days 2,190 days - child 23,360 days - adult	a, b
Body weight	15 kg - child 70 kg - adult	a, b
INCIDENTAL INGESTION:		
Soil ingestion rate	200 mg/day - child 100 mg/day - adult	b
Percent of daily soil intake from site	100%	
GI absorption factor	100%	

<u>Reference</u>:

(a) USEPA, 1989
(b) USEPA, 1991a
(c) As per Remedial Investigation Addendum Work Plan (BBL, Nov. 1993)

TABLE 18

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

EXPOSURE TO GROUND WATER

HYPOTHETICAL FUTURE RESIDENTS

FACTOR	VALUE	REFERENCE
Data set	On-site ground water	
Duration of Exposure	6 years - child 64 years - adult	d
Frequency of event	350 days/year	b
Averaging time carcinogens: non carcinogens:	 25,550 days 2,190 days - child 23,360 days - adult	a, b
Body weight	15 kg - child 70 kg - adult	a, b
INGESTION:		
Ground water ingestion rate	1 L/day - child 2 L/day - adult	b
Percent of daily ground water intake from site	100%	
DERMAL CONTACT:		
Skin surface contacting ground water	whole body	c
Skin surface area contacting ground water	7,500 cm^2 - child 20,000 cm^2 - adult	c
Dermally absorbed dose	chemical-specific (see Appendix H)	c
Event duration	0.2 hours	c

Reference:

(a) USEPA, 1989
(b) USEPA, 1991a
(c) USEPA, 1992a
(d) As per Remedial Investigation Addendum Work Plan (BBL, Nov. 1993)

TABLE 19

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

AVAILABLE USEPA RfDs and RfCs
FOR NONCARCINOGENIC HEALTH EFFECTS FOR THE CHEMICALS OF INTEREST

CHEMICAL	CHRONIC ORAL RfD (mg/kg/day)	Reference	CHRONIC INHALATION RfC (mg/m^3)	Reference
VOLATILE ORGANICS				
Vinyl chloride	ND		ND	
Acetone	1.0E-01	a	ND	
1,1-Dichloroethene	9.0E-03	a	UR	
1,1-Dichloroethane	1.0E-01	b	5.0E-01	b
1,2-Dichloroethene (cis)	1.0E-02	b	ND	
1,2-Dichloroethene (trans)	2.0E-02	a	ND	
2-Butanone	6.0E-01	b	1.0E+01	b
1,1,1-Trichloroethane	9.0E-02	b	1.0E+00	
1,1,2-Trichloroethane	4.0E-03	a	ND	
Trichloroethene	WD		UR	
Chloroform	1.0E-02	a		
Ethylbenzene	1.0E-02	a	1.0E+00	a
Trichlorofluoromethane	3.0E-01	a	ND	
Benzene	UR		UR	
Tetrachloroethene	1.0E-02	a	ND	
Toluene	2.0E-01	a	4.0E-01	b
Freon 113	3.0E+01		UR	
Methylene chloride	6.0E-02	a	3.0E+00	b
Carbon disulfide	1.0E-01	a	1.0E-02	b
Xylenes (total)	2.0E+00	a	ND	
SEMIVOLATILE ORGANICS				
2-Methylphenol	5.0E-02	a	NV	
4-Methylphenol	WD		NV	
Di-n-butylphthalate	1.0E-01	a	NV	
Bis(2-ethylhexyl)phthalate	2.0E-02	a	ND	
Phenol	6.0E-01	a	NV	b
Benzyl alcohol	3.0E-01	b	ND	
Benzoic acid	4.0E+00	a	ND	
Naphthalene	4.0E-02	b	ND	
2-Methylnaphthalene	ND		ND	
Acenaphthylene	ND		ND	
Acenaphthene	6.0E-02	a	ND	
Dibenzofuran	ND		ND	
Diethylphthalate	8.0E-01	a	ND	
Fluorene	4.0E-02	a	ND	
Phenanthrene	ND		ND	
Anthracene	3.0E-01	a	ND	
Fluoranthene	4.0E-02	a	ND	
Pyrene	3.0E-02	a	ND	
Benzo(a)anthracene	ND		ND	
Chrysene	ND		ND	
Benzo(b)fluoranthene	ND		ND	
Benzo(k)fluoranthene	ND		ND	
Benzo(a)pyrene	ND		ND	
Indeno(1,2,3-cd)pyrene	ND		ND	
Dibenzo(ah)anthracene	ND		ND	
Benzo(g,h,i)perylene	ND		ND	

TABLE 19

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

AVAILABLE USEPA RfDs and RfCs
FOR NONCARCINOGENIC HEALTH EFFECTS FOR THE CHEMICALS OF INTEREST

CHEMICAL	CHRONIC ORAL RfD (mg/kg/day)	Reference	CHRONIC INHALATION RfC (mg/m^3)	Reference
INORGANICS				
Aluminum	ND		ND	
Arsenic	3.0E−04	a	ND	
Barium	7.0E−02	a	5.0E−04	b
Beryllium	5.0E−03	a	ND	
Cadmium (water)	5.0E−04	a	UR	
Cadmium (food)	1.0E−03	a		
Chromium (III)	1.0E+00	a	UR	
Chromium (VI)	5.0E−03		UR	
Cobalt	P		ND	
Copper	ND		ND	
Iron	ND		ND	
Lead	ND		ND	
Manganese (food)	1.4E−01 (P)	b	5E−05	a
Manganese (water)	5.0E−03 (P)	b	5E−05	a
Mercury	3.0E−04	b	3.0E−04	b
Nickel	2.0E−02	a	UR	
Selenium	5.0E−03	a	ND	
Silver	5.0E−03	a	ND	
Vanadium	7.0E−03	b	ND	
Zinc	2.0E−01	b	ND	

Notes:
ND = No Data
NV = Not Verifiable
UR = Under Review
RfD = Reference Dose
RfC = Reference Concentration
CNS = Central Nervous System
WD = Withdrawn
P = Pending

Reference Source:
(a) USEPA, 1994b
(b) USEPA, 1994a

TABLE 20

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

AVAILABLE USEPA SLOPE FACTORS AND UNIT RISK FACTORS
FOR CARCINOGENIC HEALTH EFFECTS FOR THE CHEMICALS OF INTEREST

CHEMICAL	ORAL SF 1/(mg/kg/day)	USEPA HHAG CLASS	Reference	INHALATION URF 1/(ug/m^3)	USEPA HHAG CLASS	Reference
VOLATILE ORGANICS						
Vinyl chloride	1.9E+00	A	b	8.4E−05	A	b
Acetone	ND	D		ND	D	
1,1−Dichloroethene	6.0E−01	C	b	5.0E−05	C	b
1,1−Dichloroethane	ND	C		ND	C	
1,2−Dichloroethene (cis)	ND	D		ND	D	
1,2−Dichloroethene (trans)	ND	D		ND	D	
2−Butanone	ND	D		ND	D	
1,1,1−Trichloroethane	ND	D		ND	D	b
1,1,2−Trichloroethane	5.7E−02	C	a	1.6E−05	C	a
Trichloroethene	1.1E−02	C−B2	b	1.7E−06	C−B2	b
Benzene	2.9E−02	A	b	8.3E−06	A	b
Chloroform	6.1E−03	B2	a	2.3E−05		a
Ethylbenzene	ND	D	a	ND		
Trichlorofluoromethane	ND			ND		
Tetrachloroethene	5.2E−02	C−B2	b	5.8E−07	C−B2	b
Toluene	ND	D		ND	D	
Freon 113	ND	D		ND	D	
Methylene chloride	7.5E−03	B2	b	4.7E−07	B2	a
Carbon disulfide	ND	D		ND	D	
Xylenes (total)	ND	D		ND	D	
SEMIVOLATILE ORGANICS						
2−Methylphenol	ND	C	a	ND	D	
4−Methylphenol	ND	C	a	ND	C	
Di−n−butylphthalate	ND	D		ND	D	
Bis(2−ethylhexyl)phthalate	1.4E−02	B2	b	ND	B2	b
Phenol	ND	D		ND	D	
Benzyl alcohol	ND	D		ND	D	
Benzoic acid	ND	D		ND	D	
Naphthalene	ND	D		ND	D	
2−Methylnaphthalene	ND	D		ND	D	
Acenaphthylene	ND	D		ND	D	
Acenaphthene	ND	D		ND	D	
Dibenzofuran	ND	D		ND	D	
Diethylphthalate	ND	D		ND	D	
Fluorene	ND	D		ND	D	
Phenanthrene	ND	D		ND	D	
Anthracene	ND	D		ND	D	
Fluoranthene	ND	D		ND	D	
Pyrene	ND	D		ND	D	
Benzo(a)anthracene	7.3E−01	B2	c	ND	B2	
Chrysene	7.3E−03	B2	c	ND	B2	
Benzo(b)fluoranthene	7.3E−01	B2	c	ND	B2	
Benzo(k)fluoranthene	7.3E−02	B2	c	ND	B2	
Benzo(a)pyrene	7.3E+00	B2	b	ND	B2	
Indeno(1,2,3−c,d)pyrene	7.3E−01	B2	c	ND	B2	
Dibenzo(a,h)anthracene	7.3E+00	B2	c	ND	B2	
Benzo(g,h,i)perylene	ND	D		ND	D	

TABLE 20

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

AVAILABLE USEPA SLOPE FACTORS AND UNIT RISK FACTORS
FOR CARCINOGENIC HEALTH EFFECTS FOR THE CHEMICALS OF INTEREST

CHEMICAL	ORAL SF 1/(mg/kg/day)	USEPA HHAG CLASS	Reference	INHALATION URF 1/(ug/m^3)	USEPA HHAG CLASS	Reference
INORGANICS						
Aluminum	ND	D		ND	D	
Arsenic	1.75	A	b	4.3E-03	A	b
Barium	ND	D		ND	D	
Beryllium	4.3	B2	b	2.4E-03	B2	
Cadmium	ND	D		1.8E-03	B1	b
Chromium (III)	P	N		P		
Chromium (VI)	ND	D		1.2E-02	A	b
Cobalt	ND	D		ND	D	
Copper	ND	D		ND	D	
Iron	ND	D		ND	D	
Lead	ND	D		ND	D	
Manganese	ND	D		ND	D	
Mercury	ND	D		ND	D	
Nickel (refinery dust)	ND	D		4.8E-04	A	a
Selenium	ND	D		ND	D	
Silver	ND	D		ND	D	
Vanadium	ND	D		ND	D	
Zinc	ND	D		ND	D	

Notes:
ND = No Data
SF = Slope Factor
N = Not classified
P = Pending
URF = Unit Risk Factor
HHAG = Human Health Assessment Group
Class A = Known human carcinogen
Class B = Probable human carcinogen
Class B1 = Sufficient animal evidence; limited human evidence
Class B2 = Sufficient animal evidence; inadequate human evidence
Class C = Possible human carcinogen
Class D = No classification with regard to carcinogenicity

Reference:
(a) USEPA, 1994b
(b) USEPA, 1994a
(c) Toxicity values relative to benzo(a)pyrene, as per USEPA, 1993a.

TABLE 21A

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK

CALCULATION OF NON-CANCER HAZARD INDEX
INHALATION EXPOSURE TO SOILS BY HYPOTHETICAL FUTURE EXCAVATION WORKERS

Chemical	RME Soil Concentration (ug/kg)	Vapor Exposure Concentration (ug/m^3)	Dust Exposure Concentration (ug/m^3)	Inhalation Reference Concentration (mg/m^3)	Hazard Quotient
Volatile Organics					
1,2-Dichloroethene	20.2	3.0E-05	3.9E-08	ND	
Methylene chloride	1.1	3.2E-06	2.1E-09	3	1E-09
Ethylbenzene	10.5	6.0E-06	2.0E-08	1	6E-09
Toluene	17.3	1.4E-05	3.3E-08	0.4	3E-08
1,1,1-Trichloroethane	0.8	8.8E-07	1.5E-09	1	9E-10
1,1,2-Trichloroethane	1.1	6.7E-07	2.1E-09	ND	
Trichloroethene	68.5	9.2E-05	1.3E-07	ND	
Trichlorofluoromethane	1.9	6.9E-06	3.6E-09	ND	
Freon 113	0.9	3.0E-06	1.7E-09	ND	
Xylenes	15.1	7.5E-06	2.9E-08	ND	
Semivolatile Organics					
Naphthalene	980	1.0E-04	1.9E-06	ND	
2-Methylnaphthalene	622	3.1E-05	1.2E-06	ND	
Acenaphthene	1582	4.6E-05	3.0E-06	ND	
Dibenzofuran	820	3.4E-05	1.6E-06	ND	
Diethylphthalate	60	4.6E-07	1.2E-07	ND	
Fluorene	1427	2.2E-05	2.7E-06	ND	
Phenanthrene	8017	6.2E-05	1.5E-05	ND	
Anthracene	1908	1.9E-05	3.7E-06	ND	
Di-n-butyl phthalate	81	9.9E-08	1.6E-07	ND	
Fluoranthene	9482	5.4E-07	1.8E-05	ND	
Pyrene	7626	2.1E-05	1.5E-05	ND	
Benzo(a)anthracene	4441	9.8E-07	6.5E-06	ND	
Chrysene	2873	6.3E-06	5.5E-06	ND	
Benzo(b)fluoranthene	4951	1.3E-05	9.5E-06	ND	
Benzo(k)fluoranthene	1595	1.3E-07	3.1E-06	ND	
Benzo(a)pyrene	2786	9.5E-07	5.3E-06	ND	
Indeno(1,2,3-c,d)pyrene	1898	2.2E-07	3.6E-06	ND	
Dibenz(a,h)anthracene	700	1.8E-06	1.3E-06	ND	
Benzo(g,h,i)perylene	1938	4.1E-08	3.7E-06	ND	
				HAZARD INDEX =	4E-08

Notes:

ND = No data
RME = Reasonable Maximum Exposure
[1] Hazard Quotient = (Vapor Concentration + Dust Concentration)/(RfC x 1000 ug/mg)

TABLE 21B

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

CALCULATION OF POTENTIAL EXCESS CANCER RISK
INHALATION EXPOSURE TO SOILS BY HYPOTHETICAL FUTURE EXCAVATION WORKERS

Chemical	RME Soil Concentration (ug/kg)	Vapor Exposure Concentration (ug/m³)	Dust Exposure Concentration (ug/m³)	Inhalation URF 1/(ug/m³)	Inhalation Risk [1]
Volatile Organics					
Methylene chloride	1.1	2.7E-08	3.0E-11	4.7E-07	1E-14
1,1,2-Trichloroethane	1.1	5.8E-09	3.0E-11	1.6E-05	9E-14
Trichloroethene	68.5	7.8E-07	1.9E-09	1.7E-06	1E-12
				TOTAL RISK =	1E-12

Notes:

RME = Reasonable Maximum Exposure
URF = Unit Risk Factor
[1] Risk = (Vapor Concentration + Dust Concentration) x URF

TABLE 22A

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

CALCULATION OF NON-CANCER HAZARD INDICES
INHALATION EXPOSURE TO GROUND WATER BY HYPOTHETICAL FUTURE EXCAVATION WORKERS

CHEMICAL	TRENCH EXCAVATION INHALATION EXPOSURE CONCENTRATION (ug/m^3)	REFERENCE CONCENTRATION (mg/m^3)	HAZARD QUOTIENT[1]
VOLATILE ORGANICS			
Acetone	6.4E-04	ND	
Benzene	3.1E-02	ND	
2-Butanone	3.8E-05	10	4E-09
1,1-Dichloroethane	7.0E-03	1	1E-05
1,1-Dichloroethene	2.8E-03	ND	
1,2-Dichloroethene	2.4E+00	ND	
Freon 113	2.5E-01	ND	
Methylene chloride	6.3E-04	3	2E-07
Tetrachloroethene	1.1E-01	ND	
Toluene	5.4E-03	0	1E-05
1,1,1-Trichloroethane	2.9E+00	1	3E-03
Trichloroethene	1.7E+01	ND	
Vinyl chloride	1.2E+00	ND	
SEMIVOLATILE ORGANICS			
2-Methylphenol	1.1E-05	ND	
4-Methylphenol	3.2E-06	ND	
Diethylphthalate	8.8E-06	ND	
Di-n-butyl phthalate	7.9E-06	ND	
Bis(2-ethylhexyl)phthalate	1.1E-05	ND	
		Hazard Index =	3E-03

Note:

ND = No data
[1] Exposure concentration converted from ug/m^3 to mg/m^3 to calculate hazard quotient.

TABLE 26A

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

CALCULATION OF NON-CANCER HAZARD INDICES
INHALATION EXPOSURE TO GROUND WATER BY HYPOTHETICAL FUTURE RESIDENTS

CHEMICAL	SHOWER INHALATION EXPOSURE CONCENTRATION (ug/m^3)	REFERENCE CONCENTRATION (mg/m^3)	HAZARD QUOTIENT[1]
VOLATILE ORGANICS			
Acetone	1.3E-01	ND	
Benzene	1.6E+00	ND	
2-Butanone	1.2E-02	10	1E-06
1,1-Dichloroethane	3.8E-01	0.5	8E-04
1,1-Dichloroethene	1.5E-01	ND	
1,2-Dichloroethene	1.3E+02	ND	
Freon 113	1.5E+01	ND	
Methylene chloride	1.7E+00	3	6E-04
Tetrachloroethene	6.4E+00	ND	
Toluene	2.9E-01	0.4	7E-04
1,1,1-Trichloroethane	1.6E+02	1	2E-01
Trichloroethene	9.3E+02	ND	
Vinyl chloride	6.8E+01	ND	
SEMIVOLATILE ORGANICS			
2-Methylphenol	4.5E-03	ND	
4-Methylphenol	1.4E-03	ND	
Diethylphthalate	3.9E-03	ND	
Di-n-butyl phthalate	3.3E-03	ND	
Bis(2-ethylhexyl)phthalate	3.6E-03	ND	
		Hazard Index =	2E-01

Notes:

RME = Reasonable Maximum Exposure
ND = No data
[1] Exposure concentration units converted from ug/m^3 to mg/m^3 to calculate hazard quotient.

TABLE 26B

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

CALCULATION OF POTENTIAL EXCESS CANCER RISK
INHALATION EXPOSURE TO GROUND WATER BY HYPOTHETICAL FUTURE RESIDENTS

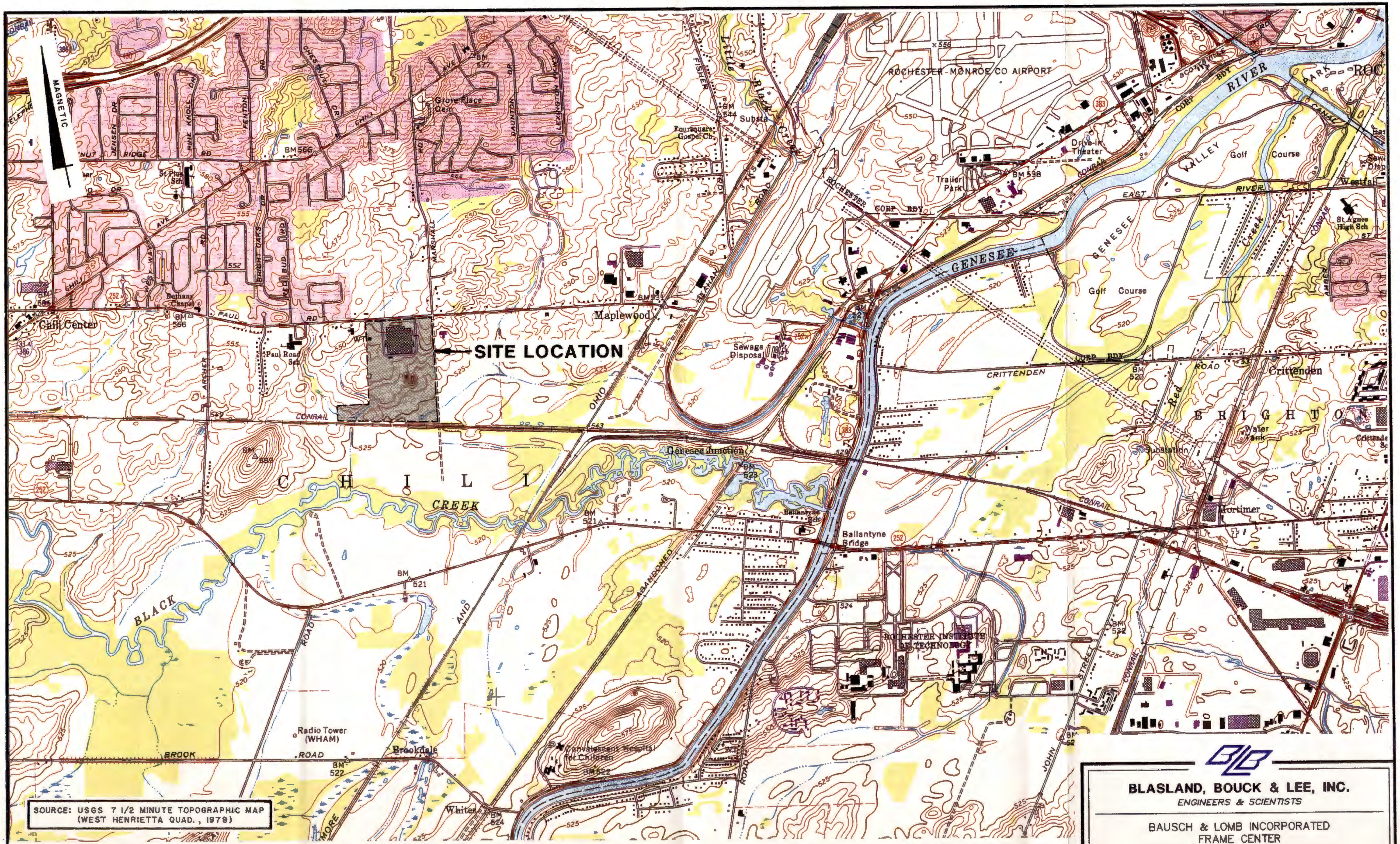
CHEMICAL	SHOWER INHALATION EXPOSURE CONCENTRATION (ug/m^3)	INHALATION URF 1/(ug/m^3)	EXCESS CANCER RISK
VOLATILE ORGANICS			
Benzene	1.6E+00	8.3E−06	1E−05
1,1−Dichloroethene	1.5E−01	5.0E−05	8E−06
Methylene chloride	1.7E+00	4.7E−07	8E−07
Tetrachloroethene	6.4E+00	5.8E−07	4E−06
Trichloroethene	9.3E+02	1.7E−06	2E−03
Vinyl chloride	6.8E+01	8.4E−05	6E−03
		Total Risk =	7E−03

Notes:

URF = Unit Risk Factor

Figures

FIGURES



SOURCE: USGS 7 1/2 MINUTE TOPOGRAPHIC MAP (WEST HENRIETTA QUAD., 1978)

SCALE:

2000' 0 2000'

BLASLAND, BOUCK & LEE, INC.

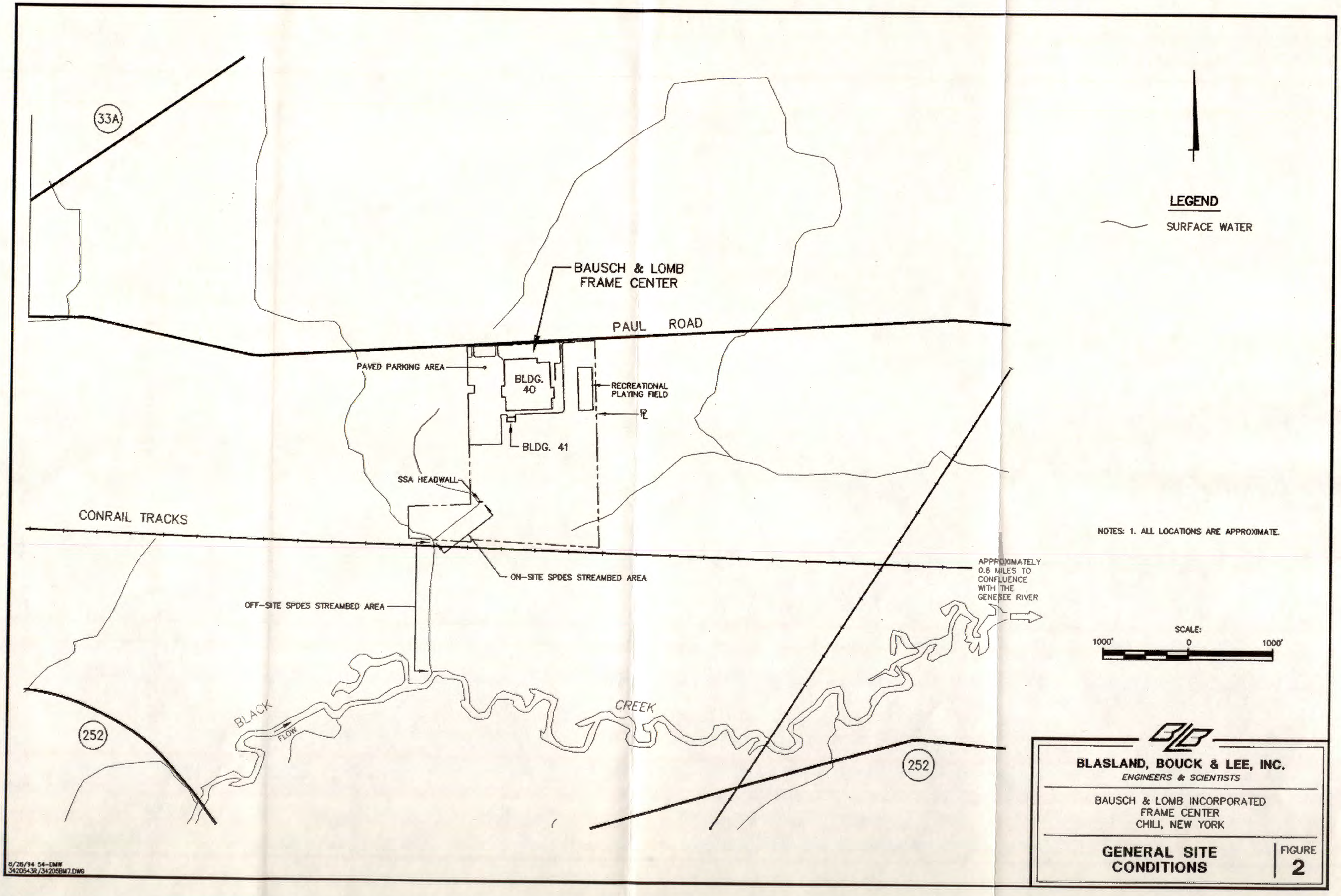
ENGINEERS & SCIENTISTS

BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK

SITE LOCATION MAP

FIGURE 1

8/26/94 54-DMW
342054SR/34205SL1.DWG

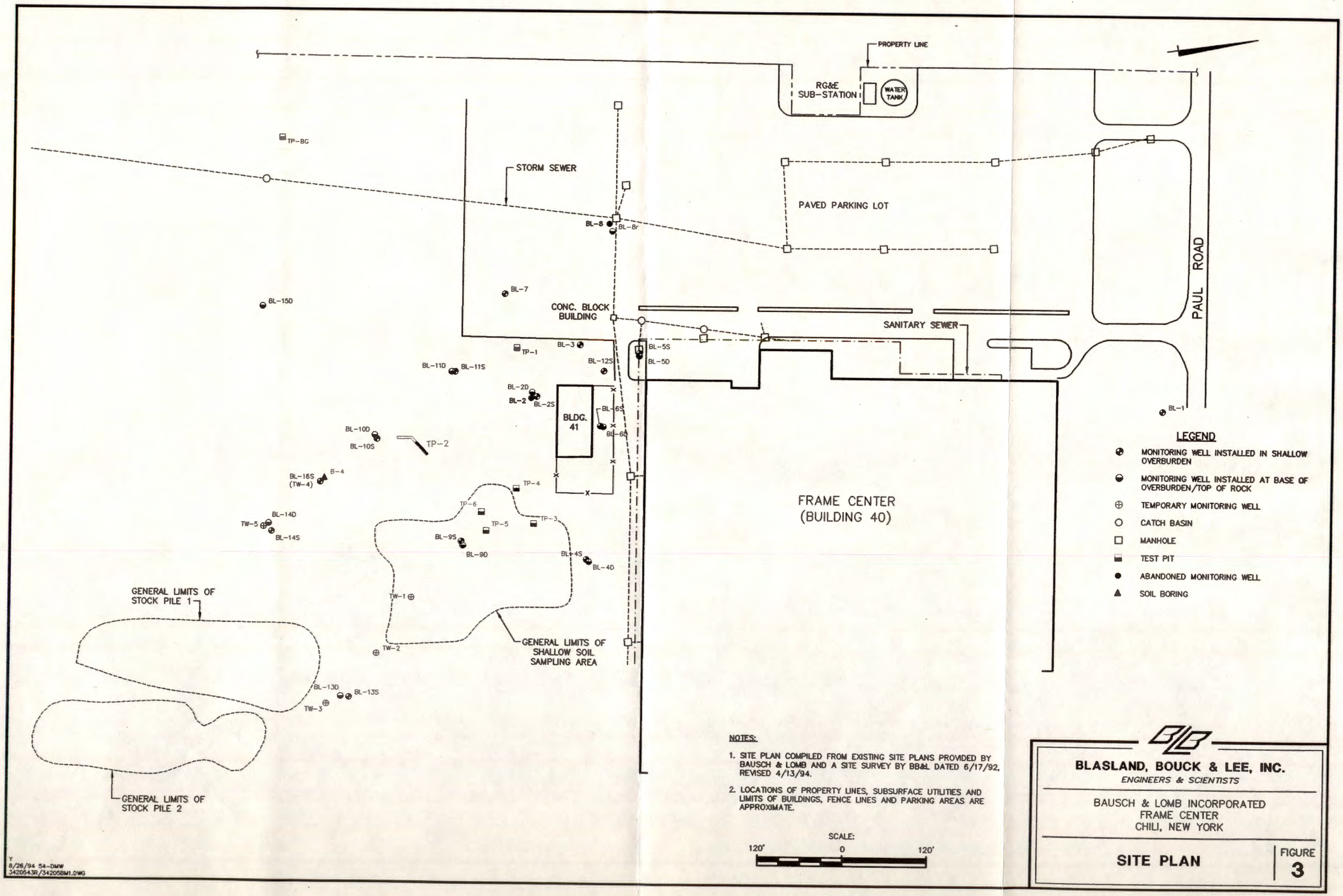


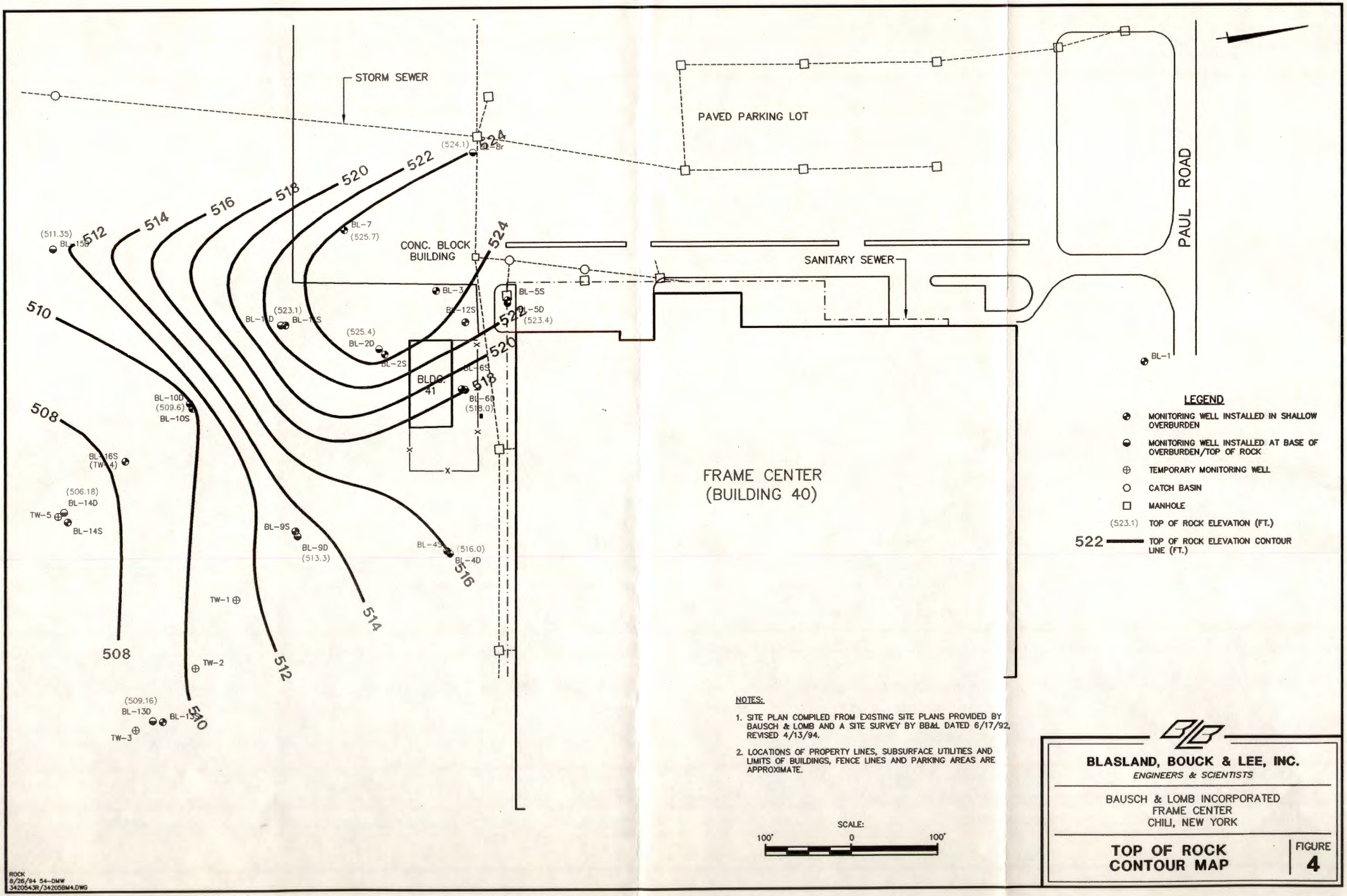
BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK

GENERAL SITE CONDITIONS

FIGURE 2


PROPERTY LINE
RG&E SUB-STATION
WATER TANK
TP-BG
STORM SEWER
PAVED PARKING LOT
PAUL ROAD
BL-8
BL-8r
BL-7
BL-15D
CONC. BLOCK BUILDING
SANITARY SEWER
BL-3
TP-1
BL-5S
BL-5D
BL-12S
BL-11D
BL-11S
BL-2D
BL-2
BL-2S
BLDG. 41
BL-6S
BL-6D
BL-1
BL-10D
BL-10S
TP-2
BL-16S (TW-4)
B-4
TP-4
TP-6
TP-3
TP-5
BL-14D
TW-5
BL-14S
BL-9S
BL-9D
BL-4S
BL-4D
FRAME CENTER (BUILDING 40)
GENERAL LIMITS OF STOCK PILE 1
TW-1
TW-2
GENERAL LIMITS OF SHALLOW SOIL SAMPLING AREA
BL-13D
BL-13S
TW-3
GENERAL LIMITS OF STOCK PILE 2
LEGEND
MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
TEMPORARY MONITORING WELL
CATCH BASIN
MANHOLE
TEST PIT
ABANDONED MONITORING WELL
SOIL BORING
NOTES:
1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.
SCALE:
120' 0 120'
BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS
BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK
SITE PLAN
FIGURE 3
8/26/94 54-DMW
3420643R/34205BM1.DWG



NOTES:

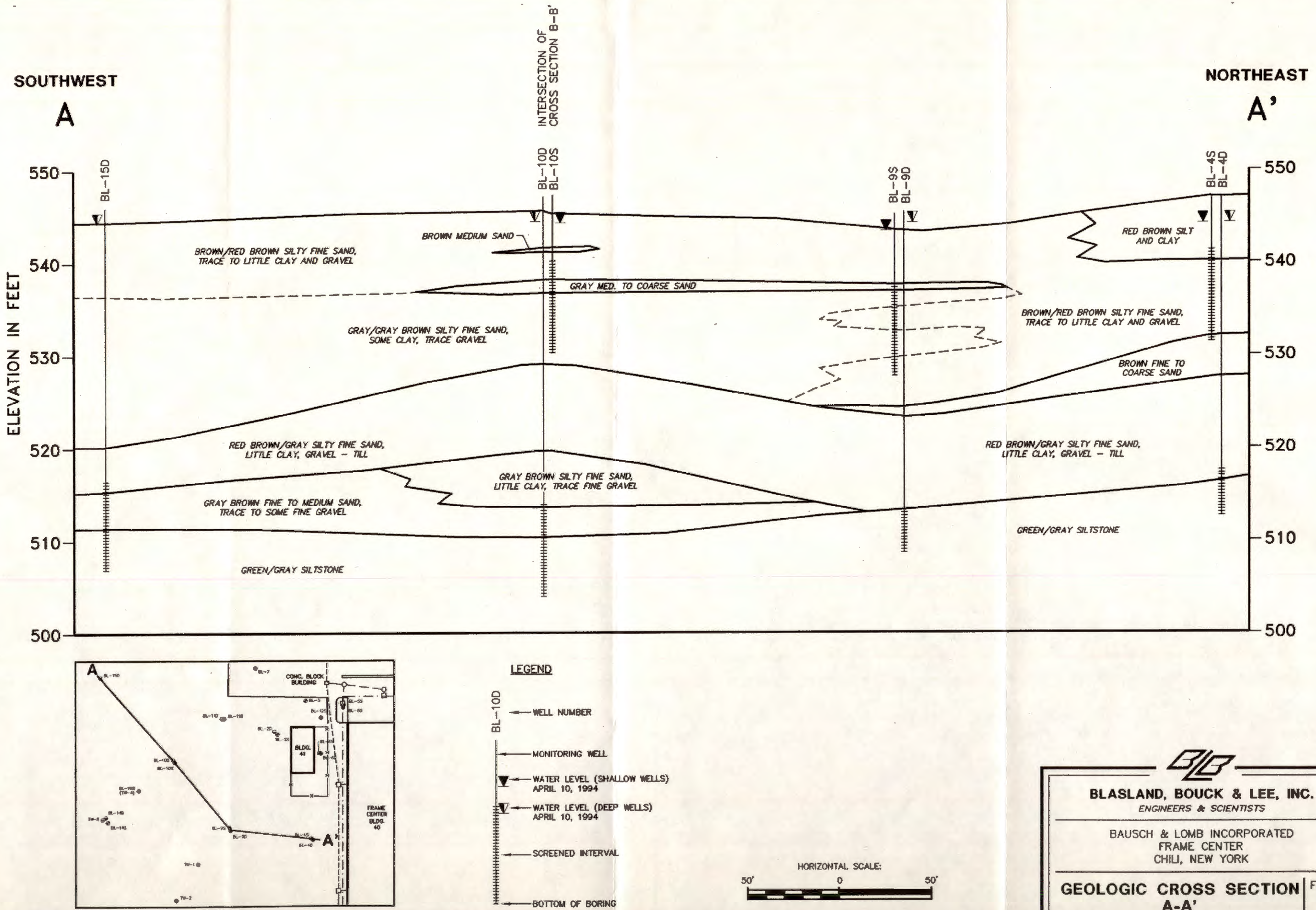
1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK

TOP OF ROCK CONTOUR MAP

FIGURE **4**



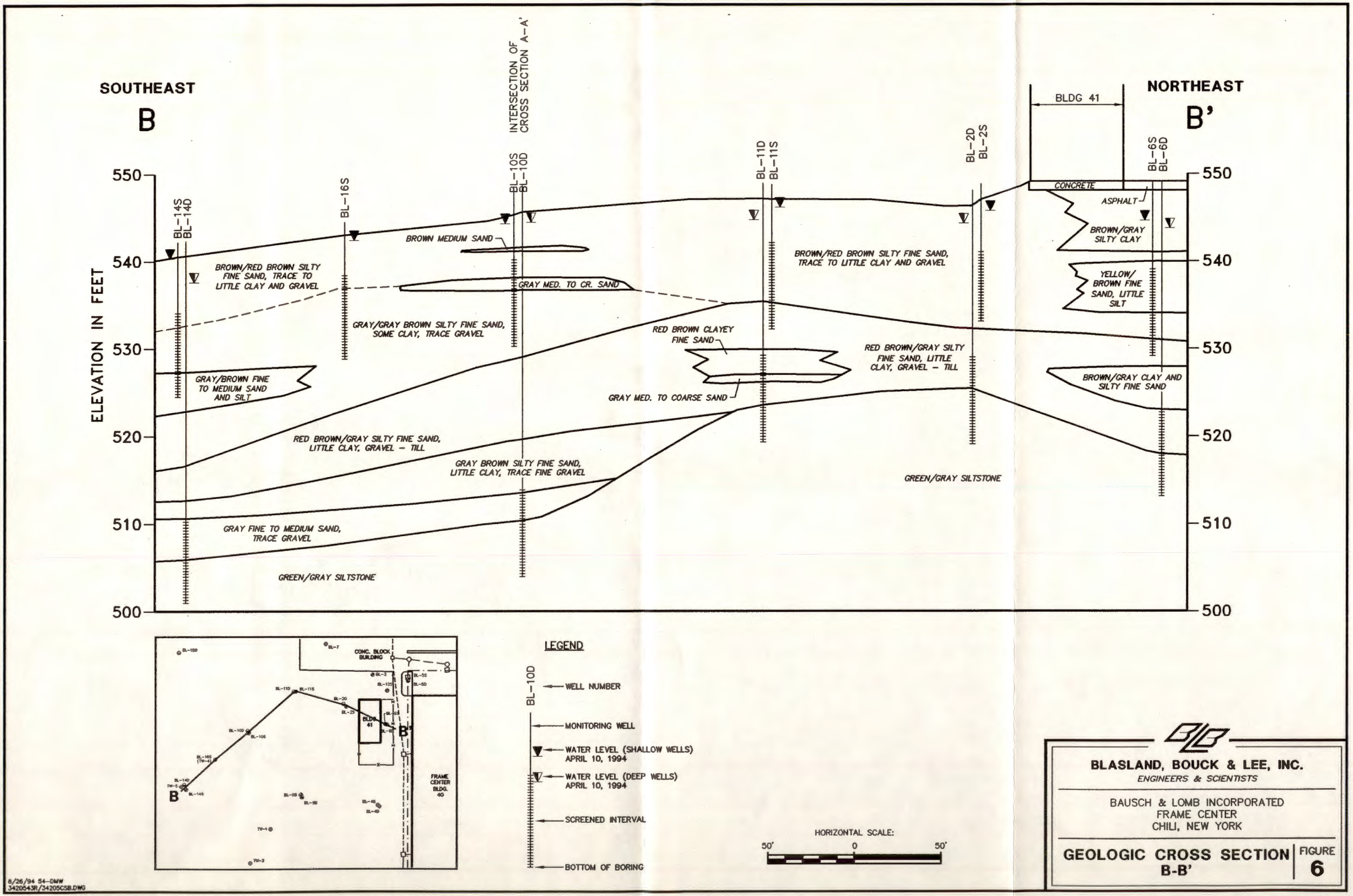
BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK

GEOLOGIC CROSS SECTION A-A'

FIGURE 5

8/26/94 54-DMW
342054SR/34205CSA.DWG



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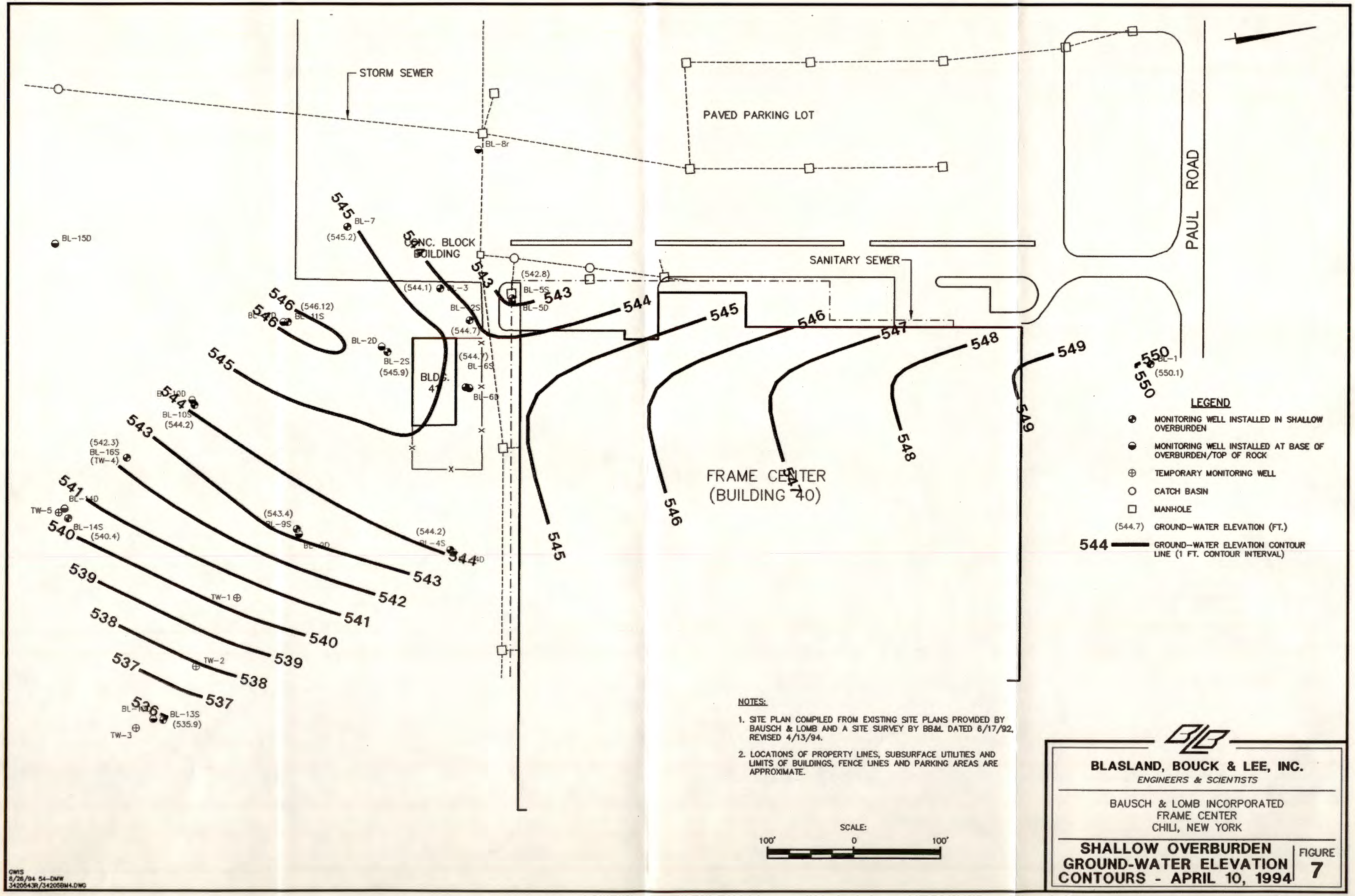
FRAME CENTER
CHILI, NEW YORK

GEOLOGIC CROSS SECTION B-B'

FIGURE 6


STORM SEWER
PAVED PARKING LOT
PAUL ROAD
CONC. BLOCK BUILDING
SANITARY SEWER
BLDG. 41
FRAME CENTER (BUILDING 40)
BL-15D
BL-8r
BL-7 (545.2)
(544.1) BL-3
(542.8) BL-5S
BL-5D
(546.12) BL-11S
BL-2D
BL-2S (545.9)
(544.7)
(544.7) BL-6S
BL-6D
BL-1 (550.1)
BL-10D
BL-10S (544.2)
(542.3) BL-16S (TW-4)
BL-14D
TW-5
BL-14S (540.4)
(543.4) BL-9S
(544.2) BL-4S
TW-1
TW-2
BL-13S (535.9)
TW-3
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
LEGEND
MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
TEMPORARY MONITORING WELL
CATCH BASIN
MANHOLE
(544.7) GROUND-WATER ELEVATION (FT.)
544 GROUND-WATER ELEVATION CONTOUR LINE (1 FT. CONTOUR INTERVAL)
NOTES:
1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.
SCALE:
100' 0 100'
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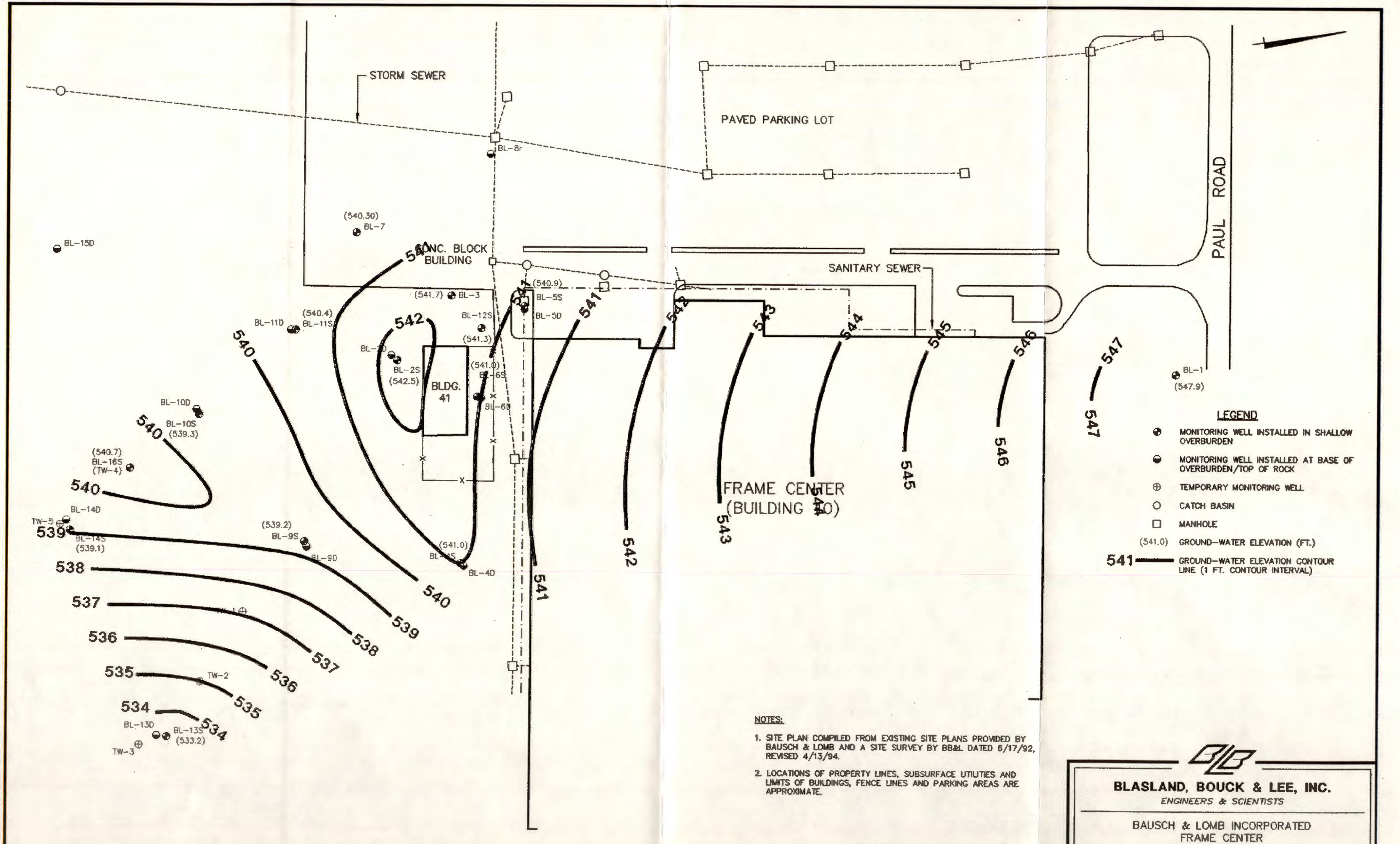
BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK
SHALLOW OVERBURDEN GROUND-WATER ELEVATION CONTOURS - APRIL 10, 1994
FIGURE 7
GWIS
8/26/94 54-DMW
3420543R/34205BM4.DWG



NOTES:

1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.

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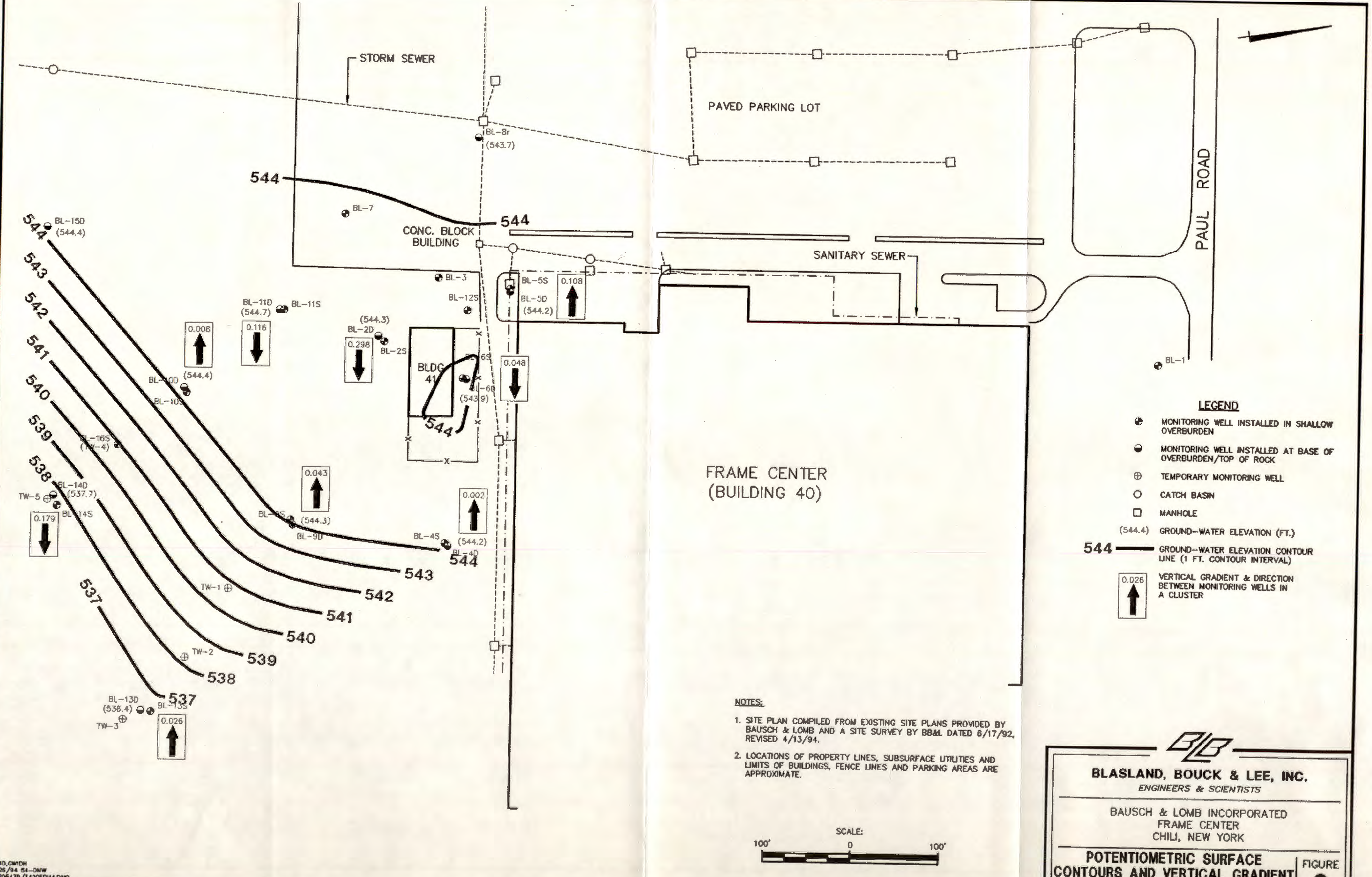
SHALLOW OVERBURDEN GROUND-WATER ELEVATION CONTOURS - JULY 12, 1994

FIGURE 8

GW2S
6/26/94 54-DMW
3420543R/34205BM4.DWG



NOTES:

1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.

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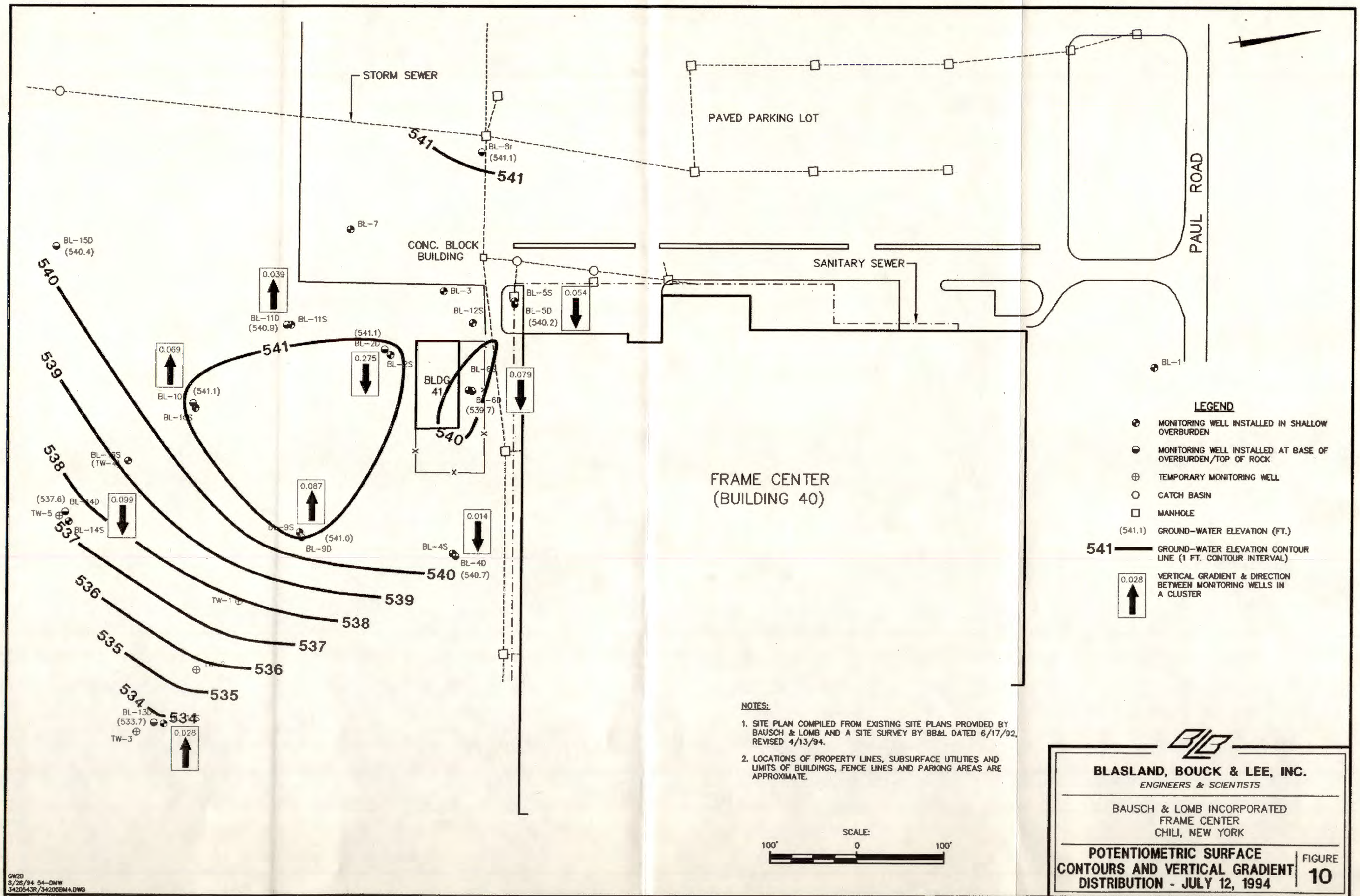
POTENTIOMETRIC SURFACE CONTOURS AND VERTICAL GRADIENT DISTRIBUTION - APRIL 10, 1994

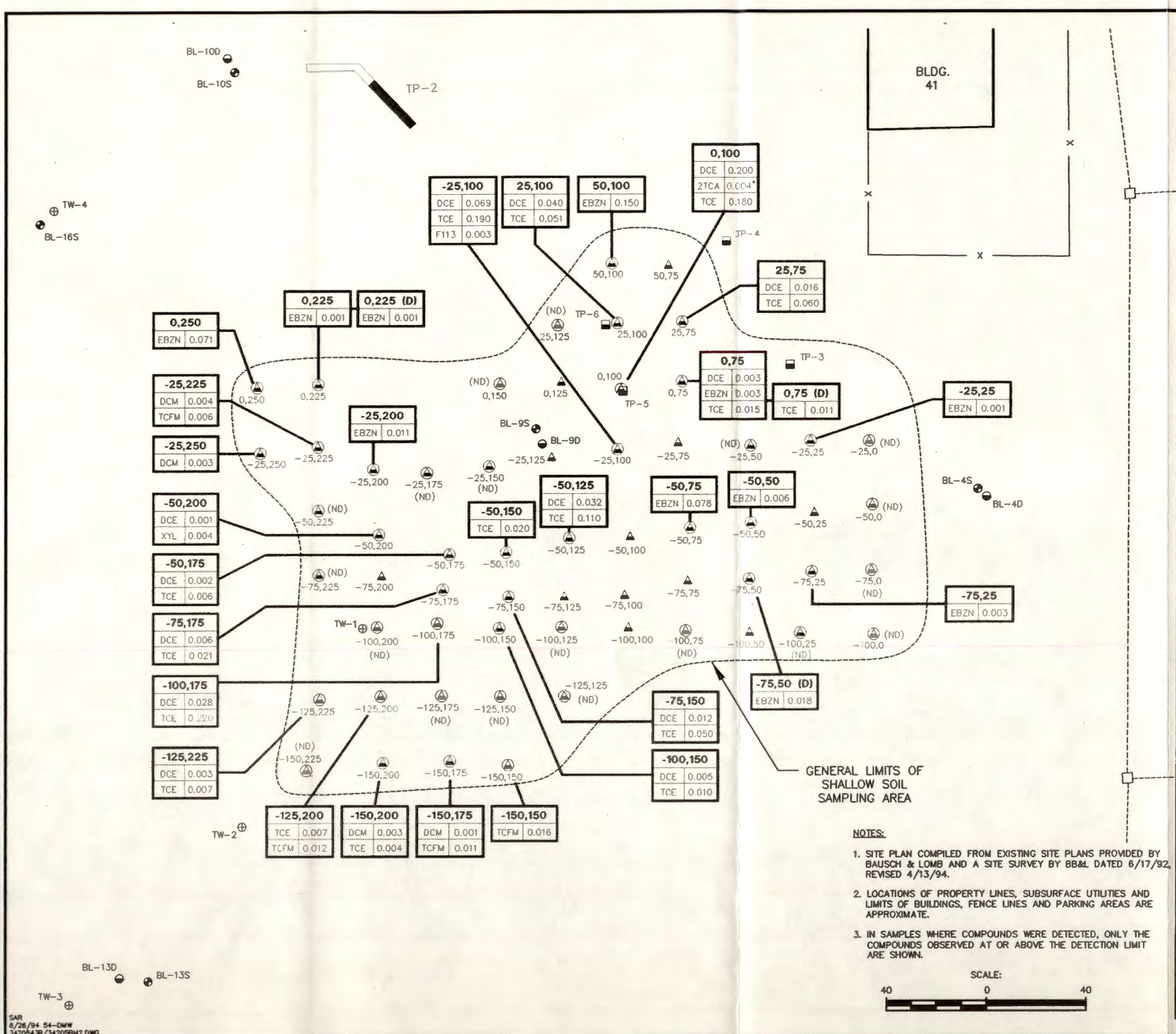
FIGURE 9

GW1D,GW1DH
8/26/94 54-DMW
3420543R/34205BM4.DWG



POTENTIOMETRIC SURFACE CONTOURS AND VERTICAL GRADIENT DISTRIBUTION - JULY 12, 1994

FIGURE 10



LEGEND

- MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
- MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
- TEMPORARY MONITORING WELL
- CATCH BASIN
- TEST PIT
- SOIL SAMPLE
- SOIL SAMPLE SUBMITTED FOR CHEMICAL ANALYSIS

SOIL ANALYTICAL RESULTS PARTS PER MILLION (mg/kg):

-150,200		
		SAMPLE NUMBER (D=DUPLICATE SAMPLE)
DCE	0.003	1,2 – DICHLOROETHYLENE (TOTAL)
DCM	0.004	DICHLOROMETHANE
EBZN	0.003	ETHYLBENZENE
2TCA	0.004*	1,1,2 – TRICHLOROETHANE
TCE	0.004	TRICHLOROETHYLENE
TCFM	0.006	TRICHLOROFLUOROMETHANE
XYL	0.004	XYLENES (TOTAL)
F113	0.003	FREON 113

* THE VALUE REPORTED FOR 1,1,2-TRICHLOROETHANE MAY REPRESENT 1,1,2-TRICHLOROETHANE, DIBROMO-CHLOROMETHANE, TRANS-1,3-DICHLORO-PROPYLENE OR ANY COMBINATION OF THE THREE COMPOUNDS.

(ND) NONE OF THE COMPOUNDS ANALYZED FOR IN THIS SAMPLE WERE OBSERVED AT OR ABOVE THE DETECTION LIMIT

NOTES:

1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.
3. IN SAMPLES WHERE COMPOUNDS WERE DETECTED, ONLY THE COMPOUNDS OBSERVED AT OR ABOVE THE DETECTION LIMIT ARE SHOWN.

SCALE: 40 0 40

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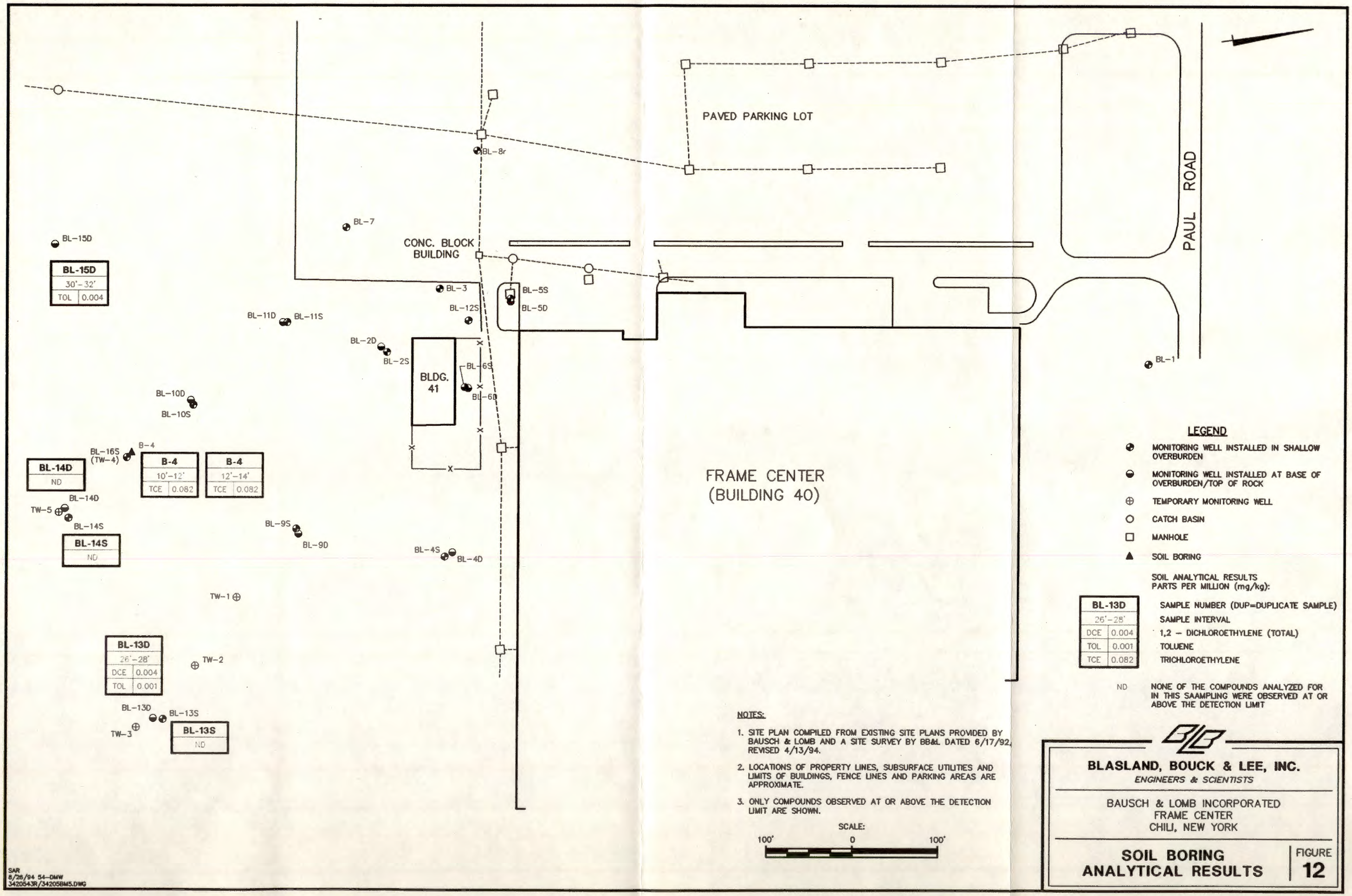
SHALLOW SOIL SAMPLING AREA ANALYTICAL RESULTS

FIGURE 11


PAVED PARKING LOT
PAUL ROAD
CONC. BLOCK BUILDING
BLDG. 41
FRAME CENTER (BUILDING 40)
BL-8r
BL-7
BL-15D
BL-15D | 30'-32' | TOL 0.004
BL-3
BL-12S
BL-5S
BL-5D
BL-11D
BL-11S
BL-2D
BL-2S
BL-6S
BL-6D
BL-1
BL-10D
BL-10S
BL-16S (TW-4)
B-4
BL-14D | ND
B-4 | 10'-12' | TCE 0.082
B-4 | 12'-14' | TCE 0.082
BL-14D
TW-5
BL-14S
BL-14S | ND
BL-9S
BL-9D
BL-4S
BL-4D
TW-1
BL-13D | 26'-28' | DCE 0.004 | TOL 0.001
TW-2
BL-13D
BL-13S
TW-3
BL-13S | ND
LEGEND
MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
TEMPORARY MONITORING WELL
CATCH BASIN
MANHOLE
SOIL BORING
SOIL ANALYTICAL RESULTS PARTS PER MILLION (mg/kg):
BL-13D — SAMPLE NUMBER (DUP=DUPLICATE SAMPLE)
26'-28' — SAMPLE INTERVAL
DCE 0.004 — 1,2 – DICHLOROETHYLENE (TOTAL)
TOL 0.001 — TOLUENE
TCE 0.082 — TRICHLOROETHYLENE
ND — NONE OF THE COMPOUNDS ANALYZED FOR IN THIS SAAMPLING WERE OBSERVED AT OR ABOVE THE DETECTION LIMIT
NOTES:
1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.
3. ONLY COMPOUNDS OBSERVED AT OR ABOVE THE DETECTION LIMIT ARE SHOWN.
SCALE:
100' 0 100'
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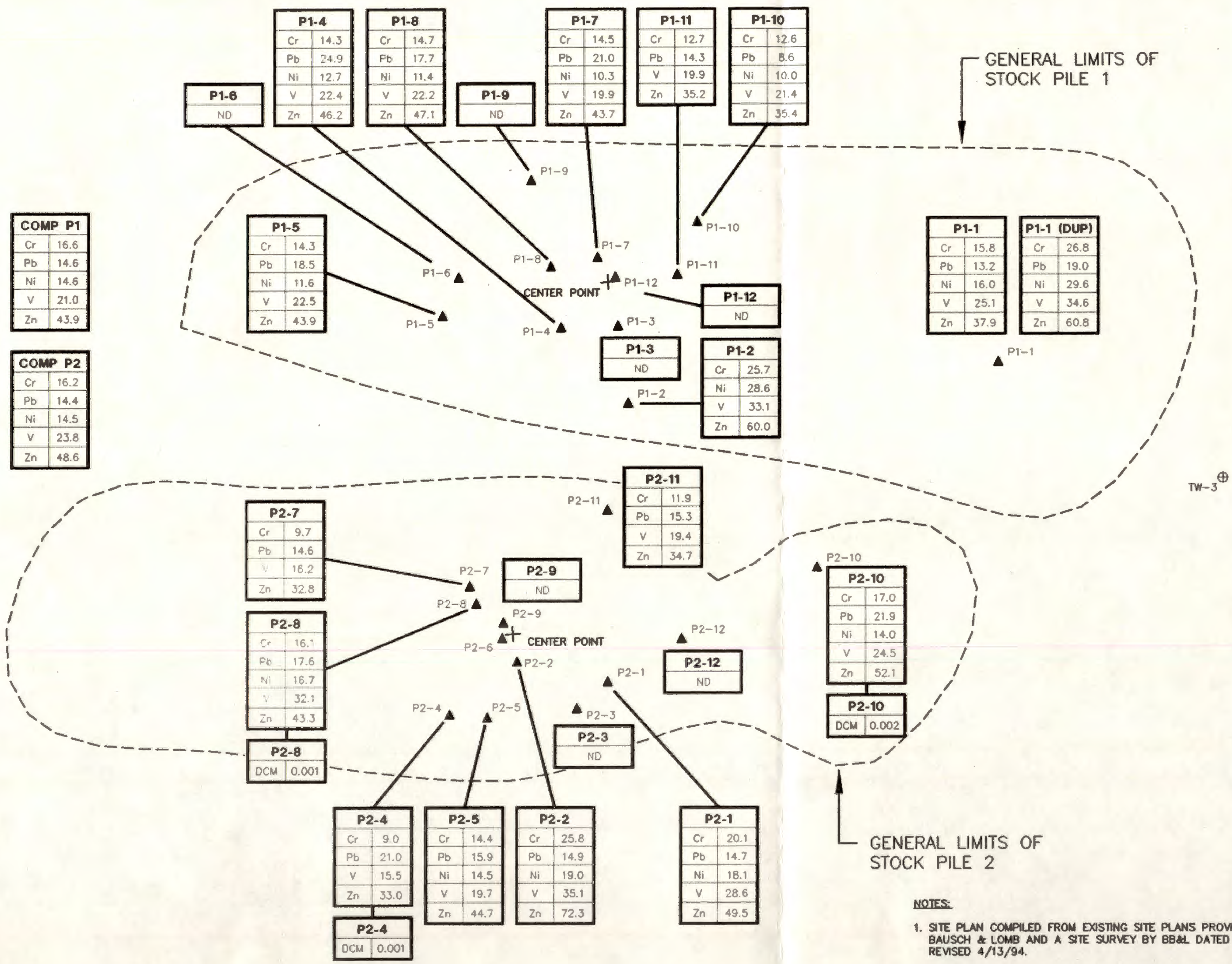
ENGINEERS & SCIENTISTS
BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK
SOIL BORING ANALYTICAL RESULTS
FIGURE 12
SAR
8/26/94 54-DMW
342054JR/34205BM5.DWG



LEGEND

- MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
- MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
- TEMPORARY MONITORING WELL
- SOIL BORING

SOIL ANALYTICAL RESULTS – INORGANICS IN PARTS PER MILLION (mg/kg):

P2-8		
		SAMPLE NUMBER
Cr	16.1	CHROMIUM
Pb	17.6	LEAD
Ni	16.7	NICKEL
V	32.1	VANADIUM
Zn	43.3	ZINC

SOIL ANALYTICAL RESULTS – VOLATILE ORGANIC COMPOUNDS – PARTS PER MILLION (mg/kg):

P2-8		
		SAMPLE NUMBER
DCM	0.001	DICHLOROMETHANE

ND NONE OF THE COMPOUNDS OR METALS ANALYZED FOR IN THIS SAMPLING WERE OBSERVED AT OR ABOVE THE DETECTION LIMIT

NOTES:

1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. ONLY COMPOUNDS OR METALS OBSERVED AT OR ABOVE THE DETECTION LIMIT ARE SHOWN.

SCALE: 40 0 40

SAR,SARHIDE,INOR,INORHIDE
8/26/94 54-DMW
342054JR/34205BM3.DWG

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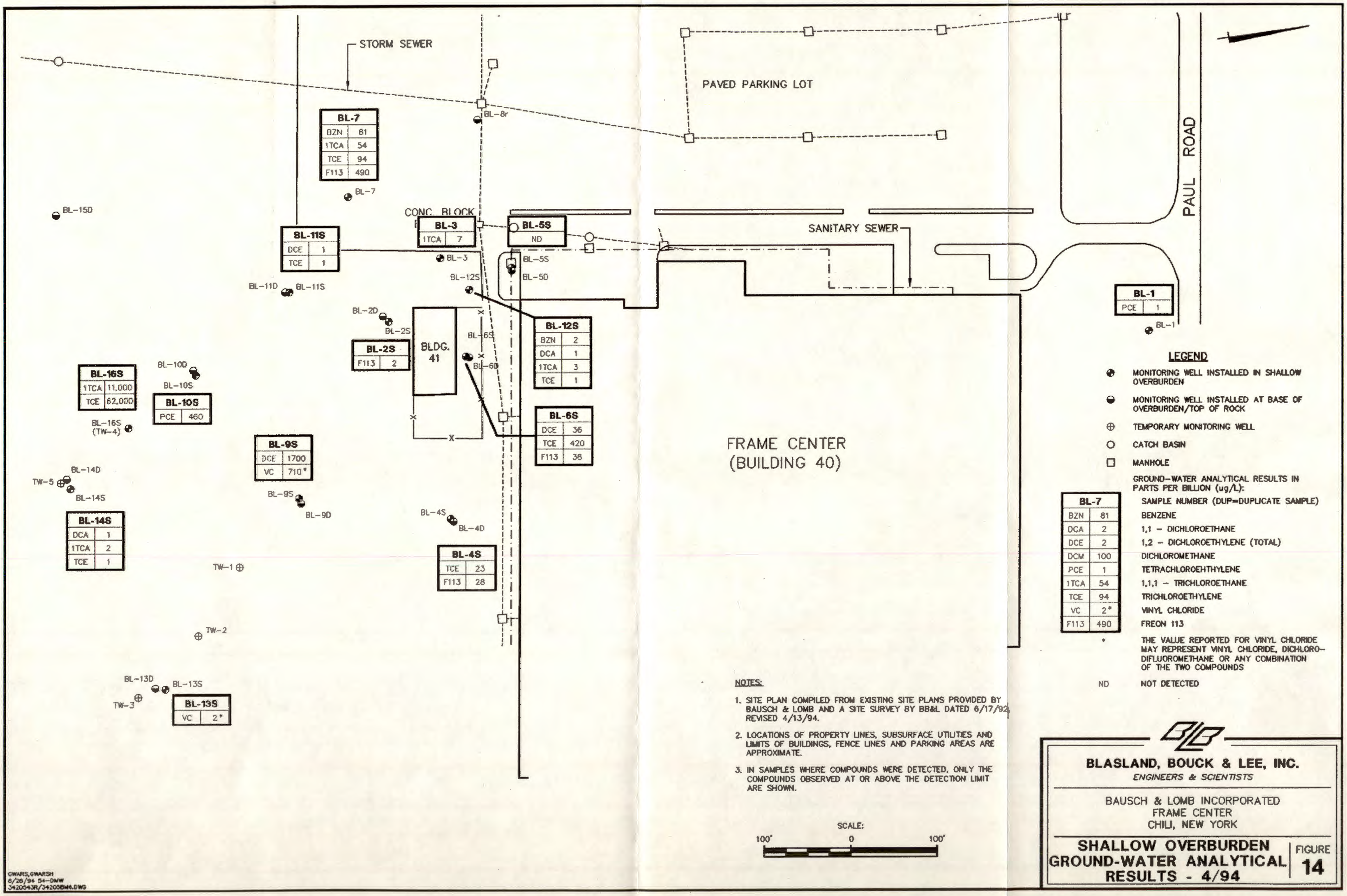
TOPSOIL PILE AREA ANALYTICAL RESULTS

FIGURE **13**


STORM SEWER
PAVED PARKING LOT
PAUL ROAD
BL-8r
BL-7
BZN 81
1TCA 54
TCE 94
F113 490
BL-7
BL-15D
CONC. BLOCK
BL-3
1TCA 7
BL-3
BL-5S
ND
BL-5S
BL-5D
SANITARY SEWER
BL-11S
DCE 1
TCE 1
BL-11D
BL-11S
BL-12S
BL-12S
BZN 2
DCA 1
1TCA 3
TCE 1
BL-1
PCE 1
BL-1
BL-2D
BL-2S
BL-2S
F113 2
BLDG. 41
BL-6S
BL-6D
BL-10D
BL-10S
BL-16S
1TCA 11,000
TCE 62,000
BL-10S
PCE 460
BL-16S (TW-4)
BL-6S
DCE 36
TCE 420
F113 38
BL-9S
DCE 1700
VC 710*
FRAME CENTER (BUILDING 40)
BL-14D
TW-5
BL-14S
BL-9S
BL-9D
BL-4S
BL-4D
BL-14S
DCA 1
1TCA 2
TCE 1
BL-4S
TCE 23
F113 28
TW-1
TW-2
BL-13D
BL-13S
TW-3
BL-13S
VC 2*
LEGEND
MONITORING WELL INSTALLED IN SHALLOW OVERBURDEN
MONITORING WELL INSTALLED AT BASE OF OVERBURDEN/TOP OF ROCK
TEMPORARY MONITORING WELL
CATCH BASIN
MANHOLE
GROUND-WATER ANALYTICAL RESULTS IN PARTS PER BILLION (ug/L):
BL-7 SAMPLE NUMBER (DUP=DUPLICATE SAMPLE)
BZN 81 BENZENE
DCA 2 1,1 - DICHLOROETHANE
DCE 2 1,2 - DICHLOROETHYLENE (TOTAL)
DCM 100 DICHLOROMETHANE
PCE 1 TETRACHLOROEHTHYLENE
1TCA 54 1,1,1 - TRICHLOROETHANE
TCE 94 TRICHLOROETHYLENE
VC 2* VINYL CHLORIDE
F113 490 FREON 113
* THE VALUE REPORTED FOR VINYL CHLORIDE MAY REPRESENT VINYL CHLORIDE, DICHLORODIFLUOROMETHANE OR ANY COMBINATION OF THE TWO COMPOUNDS
ND NOT DETECTED
NOTES:
1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.
3. IN SAMPLES WHERE COMPOUNDS WERE DETECTED, ONLY THE COMPOUNDS OBSERVED AT OR ABOVE THE DETECTION LIMIT ARE SHOWN.
SCALE:
100' 0 100'
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BAUSCH & LOMB INCORPORATED
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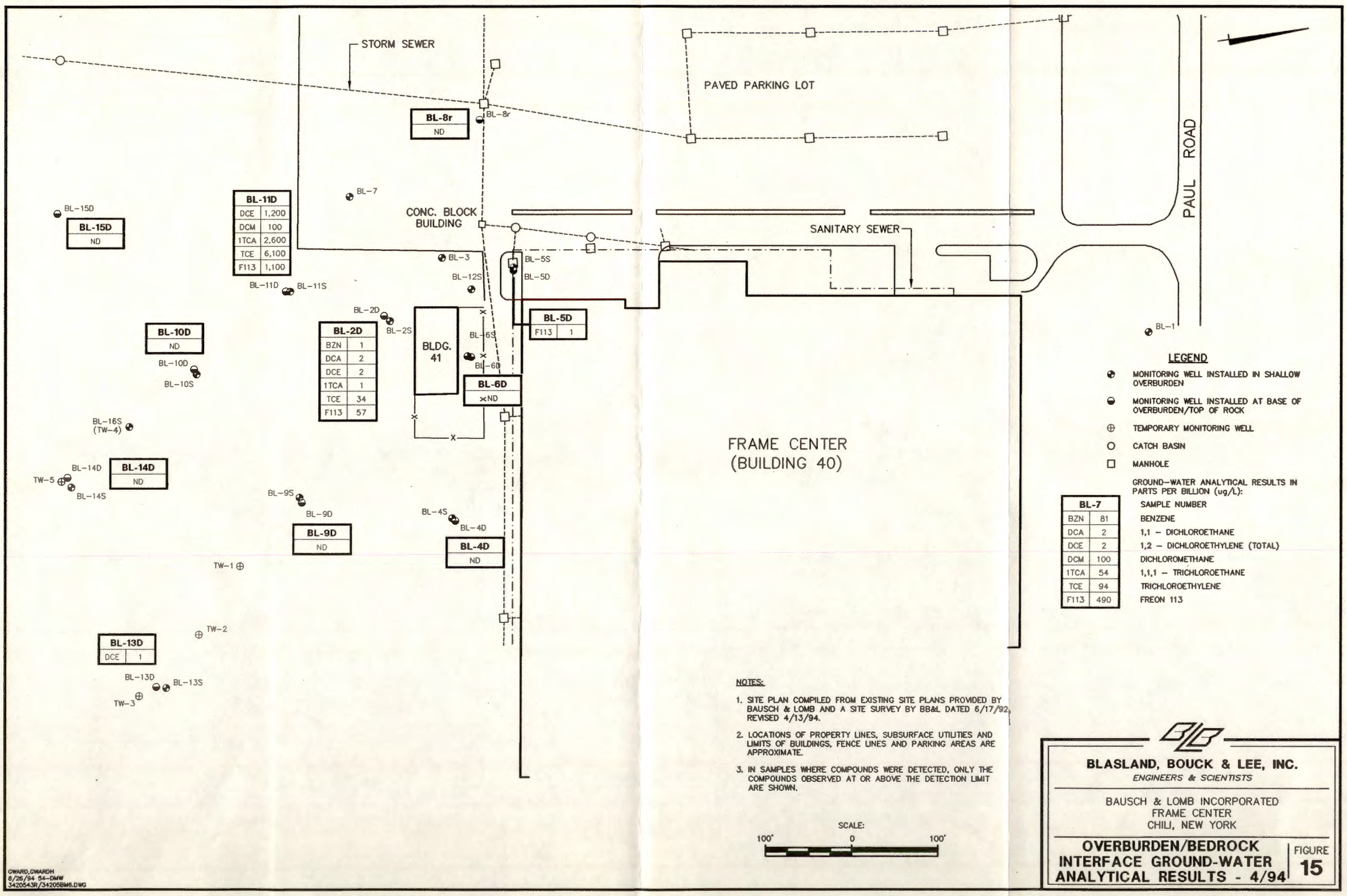
SHALLOW OVERBURDEN GROUND-WATER ANALYTICAL RESULTS - 4/94
FIGURE 14
GWARS,GWARSH
8/26/94 54-DMW
3420543R/34205BM6.DWG



NOTES:

1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.
3. IN SAMPLES WHERE COMPOUNDS WERE DETECTED, ONLY THE COMPOUNDS OBSERVED AT OR ABOVE THE DETECTION LIMIT ARE SHOWN.

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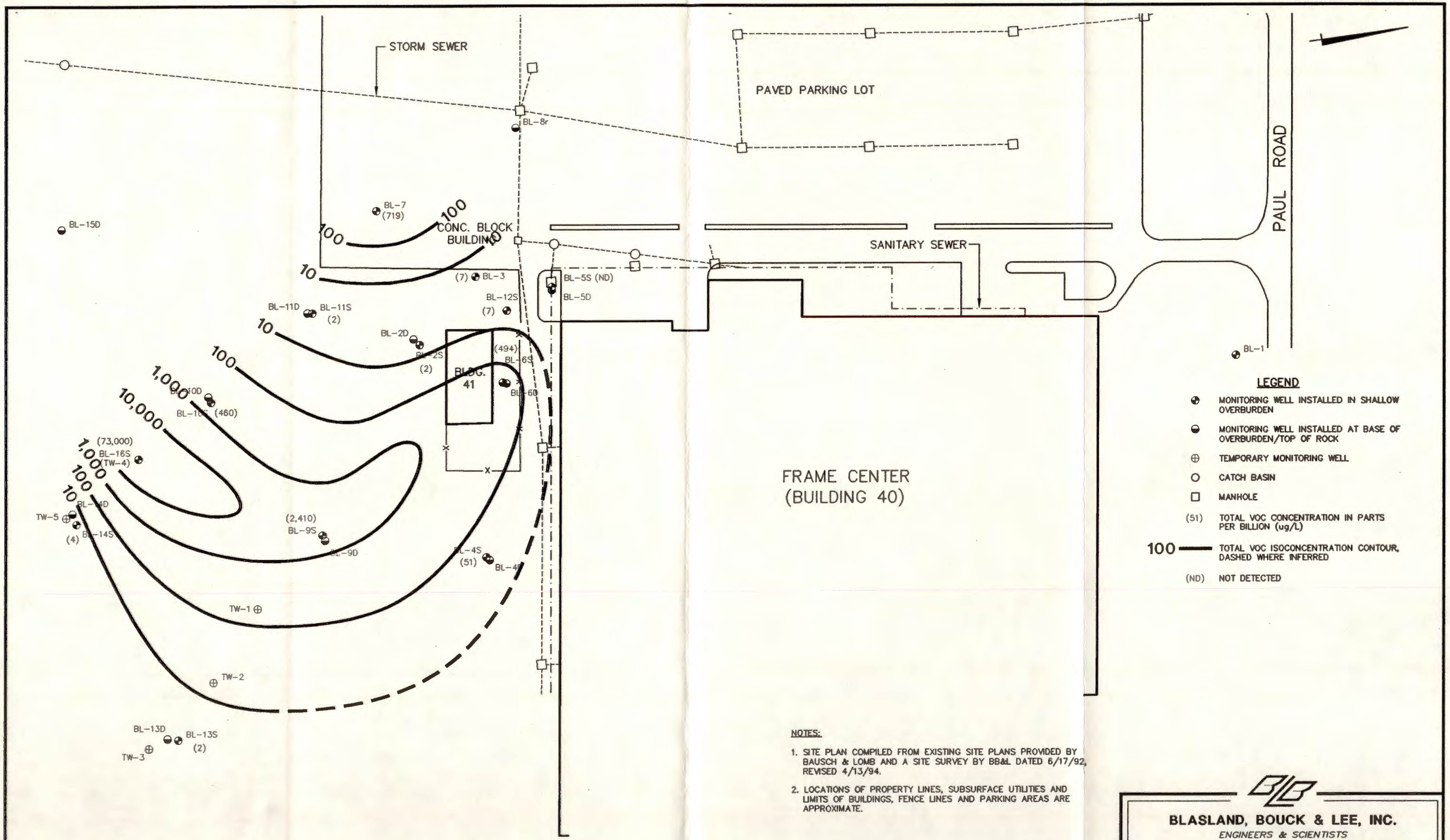
OVERBURDEN/BEDROCK INTERFACE GROUND-WATER ANALYTICAL RESULTS - 4/94

FIGURE 15



NOTES:

1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.

SCALE:
100' 0 100'

VOCS
8/26/94 54-DMW
3420543R/34205BM6.DWG

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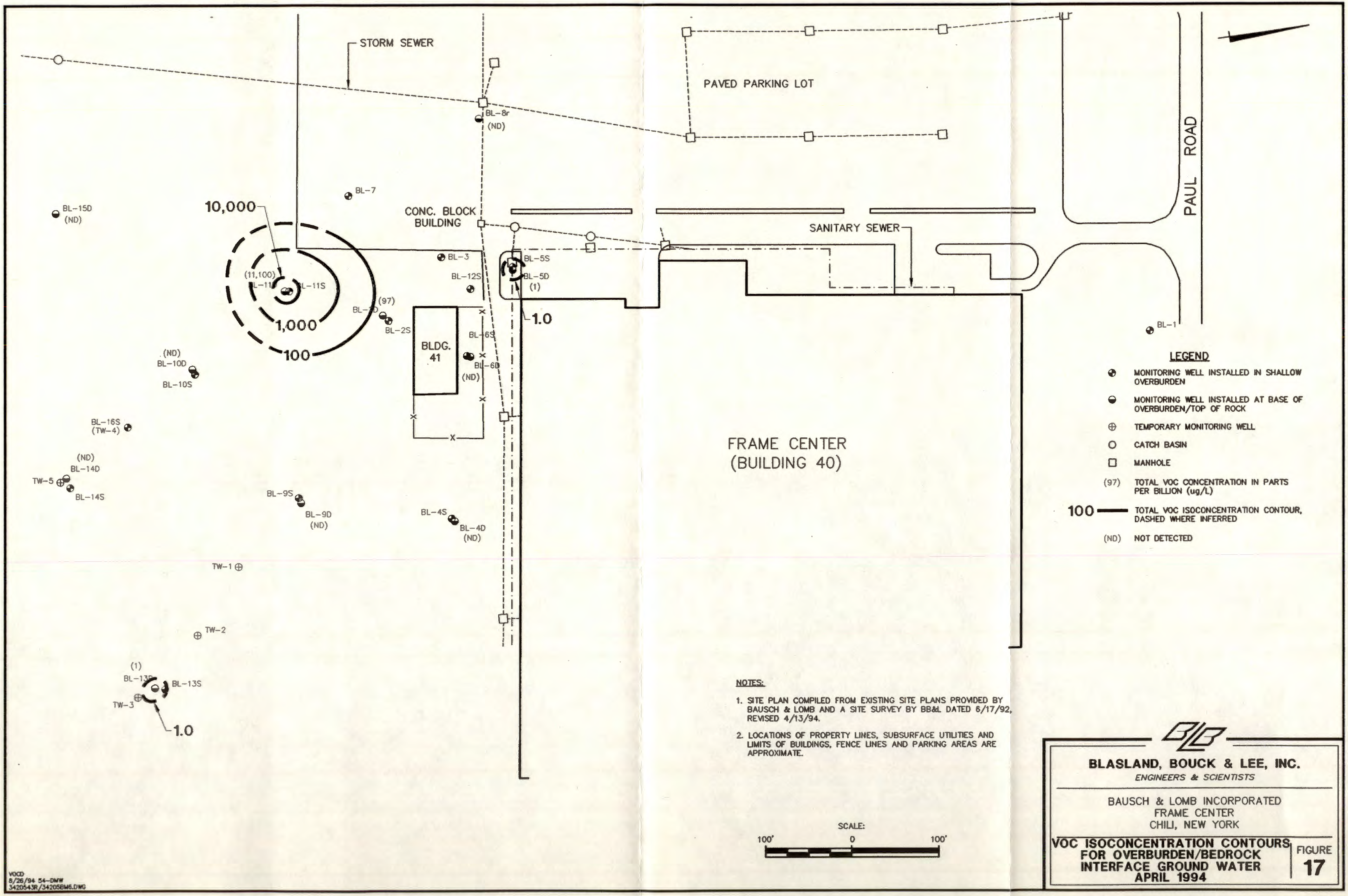
CHILI, NEW YORK

VOC ISOCONCENTRATION CONTOURS FOR SHALLOW OVERBURDEN GROUND WATER
APRIL 1994

FIGURE
16



NOTES:

1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.

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CHILI, NEW YORK

VOC ISOCONCENTRATION CONTOURS FOR OVERBURDEN/BEDROCK INTERFACE GROUND WATER APRIL 1994

FIGURE **17**

Appendices

APPENDIX A

Field Methodologies

APPENDIX A

Field Methodologies

A-1 Well Installation Activities

A-2 Water-Level Gauging

A-3 Well Development and Hydraulic Conductivity Testing

A-4 Shallow Soil Sampling Area Activities

A-5 Topsoil Pile Sampling

A-6 Ground-Water Sampling

APPENDIX A-1

Well Installation Activities

Six ground-water monitoring wells and five temporary ground-water monitoring wells were installed on March 15 through 25, 1994. All drilling and well installation activities were performed by the Nothnagle Drilling Company of Scottsville, New York. Due to the wet, soft, and brush-covered ground surface conditions at the site, an all-terrain CME-57 Mobile Drill rig was utilized.

Temporary Well Installation

As required by the RI Addendum Work Plan, five shallow temporary monitoring wells, designated TW-1, TW-2, TW-3, TW-4, and TW-5, were installed prior to the installation of the permanent ground-water monitoring wells. These wells were installed to delineate the limits of the VOCs in the shallow ground water, which had been identified during previous investigations. The following table summarizes the temporary well construction details:

Location	Total Depth (Ft.)	Screen Interval (Ft.)	Sand Pack Interval (Ft.)
TW-1	10.0	0.5 - 10.0	0.5 - 10.0
TW-2	10.0	2.0 - 10.0	1.0 - 10.0
TW-3	10.0	1.0 - 10.0	0.5 - 10.0
TW-4	14.3	4.4 - 14.1	2.3 - 14.3
TW-5	10.0	2.0 - 10.0	1.0 - 10.0

The temporary wells were established approximately 100 feet apart along lines which had been projected to be hydraulically downgradient from existing well clusters BL-9 and BL-10. Shortly after the temporary wells were installed, a limited elevation survey was performed to determine the elevation of a reference point on each temporary well. Depth to ground water at the temporary wells and selected monitoring wells were determined on March 18, 1994, and were then converted to ground-water elevations. As provided on Figure A-1.1 of this Appendix, a shallow overburden ground-water elevation contour map was developed for that date.

On March 16, 1994, ground-water samples were obtained from the temporary wells and analyzed for volatile organic compounds (VOCs) by EPA Method 8010/8020, including Freon 113, on a rush turnaround basis. These analyses were performed by General Testing Company (General Testing) of Rochester, New York, and were intended only for screening purposes. The collection of Quality Assurance/Quality Control (QA/QC) samples were not required in the RI Addendum Work Plan for these samples. The elevation contours developed for March 18, 1994, were evaluated and used in conjunction with the ground-water analytical results to determine the placement of the permanent monitoring well.

Permanent Monitoring Well Installation

Clusters BL-13 and BL-14 were strategically located in downgradient locations where the ground-water analytical results from the temporary wells indicated that the total VOC concentration was equal to or less than 50 parts per billion (ppb), representing the outer limit of the VOC-containing ground-water plume. The following monitoring wells were installed as well clusters in the downgradient areas: BL-13S and BL-13D; BL-14S and BL-14D. The "S" wells were designed to monitor ground-water quality and conditions in the shallow overburden material, whereas the "D" wells were designed to monitor the ground water in the lowermost overburden and uppermost portion of the bedrock. Monitoring well BL-15D was strategically located approximately 280 feet south and downgradient of existing well cluster BL-11. This location was selected based on the presence of VOCs previously detected at BL-11D and the need to monitor the extent of contamination in the lowermost overburden and uppermost bedrock. A shallow overburden well was not installed at this location due to the low concentration of VOCs previously detected upgradient at BL-11S.

During completion of the soil boring at BL-14D, the subsurface conditions at that location were found to be somewhat different from those anticipated based on the conditions previously observed at the BL-13 cluster location monitoring well and BL-15D. At the BL-14 location, a fine to medium sand zone was observed overlying the till. This sandy zone extended from approximately 14 feet to 24 feet below grade. This sandy zone had not previously been observed in a significant thickness at the BL-13 cluster or at BL-15 and was not anticipated to be present at the BL-14 location. The sandy zone observed above the bedrock and below the till at BL-14 was thinner and appeared to be less conductive than the unit(s) observed above the bedrock at the BL-13 cluster and at BL-15. Since the sandy zone overlying the till had the potential for transmitting water and was not previously monitored by temporary well point TW-5, which had been installed at 2 to 8 feet below grade in the close proximity to the BL-14 boring, a field decision was made, with the concurrence of the on-site New York State Department of Environmental Conservation (NYSDEC) representative, to install a well within the sandy unit above the till, but slightly deeper than the other shallow overburden wells at the site.

As a result of the ground-water screening activity, elevated concentrations of VOCs were detected in the ground-water samples collected from temporary well TW-4. A decision was agreed upon by Bausch & Lomb, the NYSDEC, and BB&L that temporary well TW-4 be completed as a permanent monitoring well. The retrofitted temporary well TW-4 was designated as BL-16S.

All of the deep borings (Suffix D) were sampled continuously with a standard 2-foot-long, 2-inch outside diameter steel split-spoon sampler. At each of these borings, samples were selected for submission for analysis of VOCs; therefore, the split-spoon samplers were decontaminated after each use by means of an Alconox solution scrub, a 10 percent methanol spray, followed by a distilled water rinse. After containerization of samples for screening and potential analysis, as discussed below, the recovered soil samples were described by the on-site geologist. The information recorded included: soil classification, color, relative moisture, length of recovery, blow counts, and any miscellaneous observations. Descriptions of subsurface materials encountered and a graphic representation of well depth, screen placement, sand pack, bentonite seal, grout (where applicable), and surface completions are presented in the subsurface boring logs provided in Appendix B. Continuous soil sampling was not performed during the installation of the temporary wells. To characterize the subsurface soils in the area of monitoring well BL-16S, soil boring B-4 located adjacent to BL-16S was continuously sampled.

Immediately following split-spoon retrieval, soil samples were divided such that one representative portion was retained in glassware provided by OBG Laboratories, Inc. (OBG) for potential laboratory analysis for VOCs. The other portion was placed in a "Zip-Loc" plastic bag and sealed. The bag samples were allowed to equilibrate to room temperature, at which time the headspace in the bag was screened for volatile organics, using a HNU photoionization detector (PID) equipped with a 10.2 eV lamp. The PID was calibrated daily for a 1:1 response to 100 ppm isobutylene. The soil samples that displayed the highest headspace results from within the screened interval at that location was selected for submittal to OBG for analysis. The results of the headspace screening are presented on the subsurface logs. A summary of the soil samples submitted to OBG for chemical analysis of VOCs by Method 8010/8020, including Freon 113, is provided below:

Boring	Sample Interval (ft.)
B-4	10 - 12
B-4	12 - 14
BL-13S	10 - 12
BL-13D	26 - 28
BL-14S	18 - 20
BL-14D	34 - 36
BL-15D	30 -32

In addition to the soil samples collected for VOC analyses, samples were also collected for grain-size analysis and for total organic carbon (TOC) analysis using a Modified Lloyd Kahn method. Grain-size analysis was performed on each of the recovered soil samples from the continuously sampled BL-14D boring. Grain-size analysis was performed by Parratt-Wolff, Inc. of Syracuse, New York. The grain-size analysis results are presented in Appendix C. The grain-size data will be used during the evaluation of alternatives during the Feasibility Study.

Soil samples were collected for TOC analysis from within the screened interval at BL-13S, BL-14S, and B-4. At each location, a composite soil sample was collected from the split-spoon samples obtained from the screened interval that were observed to be saturated during the time of drilling. At the base of overburden top-of-bedrock wells (BL-13D, BL-14D, and BL-15D), two composite samples were obtained from the screened interval per location. One sample was composited from the available overburden and the other from the top-of-bedrock material. The following is a summary of soil samples submitted for TOC analysis:

Boring	Sample Interval (ft.)
B-4	10 - 12
B-4	12 - 14
BL-13S	12 - 14
BL-13D	28 - 30
BL-13D	32 - 34
BL-14S	18 - 24
BL-14D	30 - 34
BL-14D	36 - 40
BL-15D	28 - 30
BL-15D	34 - 38

All boreholes were advanced with 4¼-inch-inside-diameter hollow-stem augers. Monitoring wells were constructed of 2-inch-diameter, Schedule 40 PVC 0.010-inch machine-slotted well screen and 2-inch-diameter, Schedule 40 PVC riser. A Ricci-brand quartz sand pack, grade "00" for the "S" wells and "00N" for the "D" wells, was placed around the well screen from the bottom of the borehole to a minimum of 0.9 feet above the top of the screen. Grain-size curves for these sands are provided in Appendix D with the grain-size curves generated for the samples from boring BL-14. A hydrated bentonite seal (minimum thickness of 1.3 feet) was placed above the sand, and the remainder of the annulus was filled with cement/bentonite grout to within approximately 1.5 feet of the ground surface. The grout mixture consisted of: a bag of Portland Cement (90 lb.), mixed with approximately 5 pounds of powdered bentonite and 6 to 8 gallons of water. The wells were completed at the surface with a 4-inch by 4-inch above-grade locking steel protective casing, set in a 2-foot-diameter by 1.5-foot-thick concrete surface pad.

The temporary wells were constructed of 2-inch-diameter, Schedule 40 PVC riser and 0.010-inch slot screen. A Ricci grade 00 sand was placed around the well screen from the bottom of the borehole to a minimum of 0.5 feet above the top of the screen. A hydrated bentonite seal was placed above the sand pack, and the remainder of the annulus was backfilled with cuttings soil. After groundwater samples were collected and analyzed from the temporary wells, the wells were decommissioned, with the exception of TW-4 which, as discussed above, was retrofitted into a permanent monitoring well. The decommissioning was accomplished by removing the well's PVC screen and riser, followed by overdrilling the borehole to the boring's total depth and tremie grouting the borehole to ground surface. All drilling equipment and tools were decontaminated after use at each boring location. The decontamination procedure consisted of a high pressure, hot water steam cleaning.

Pre-existing monitoring well BL-8, located in the employee parking lot to the west of Building 41, was decommissioned due to a damaged surface protective casing. The damage, caused by snow plowing activities, allowed parking lot run-off and sediment to accumulate in the well. The well was decommissioned using the same procedures as above, and a replacement well, designated as BL-8r, was installed approximately 8 feet northeast and upgradient of the abandoned well. The installation details (screen length, depth, soil descriptions, etc.) for BL-8r were duplicated from the previous well, BL-8.

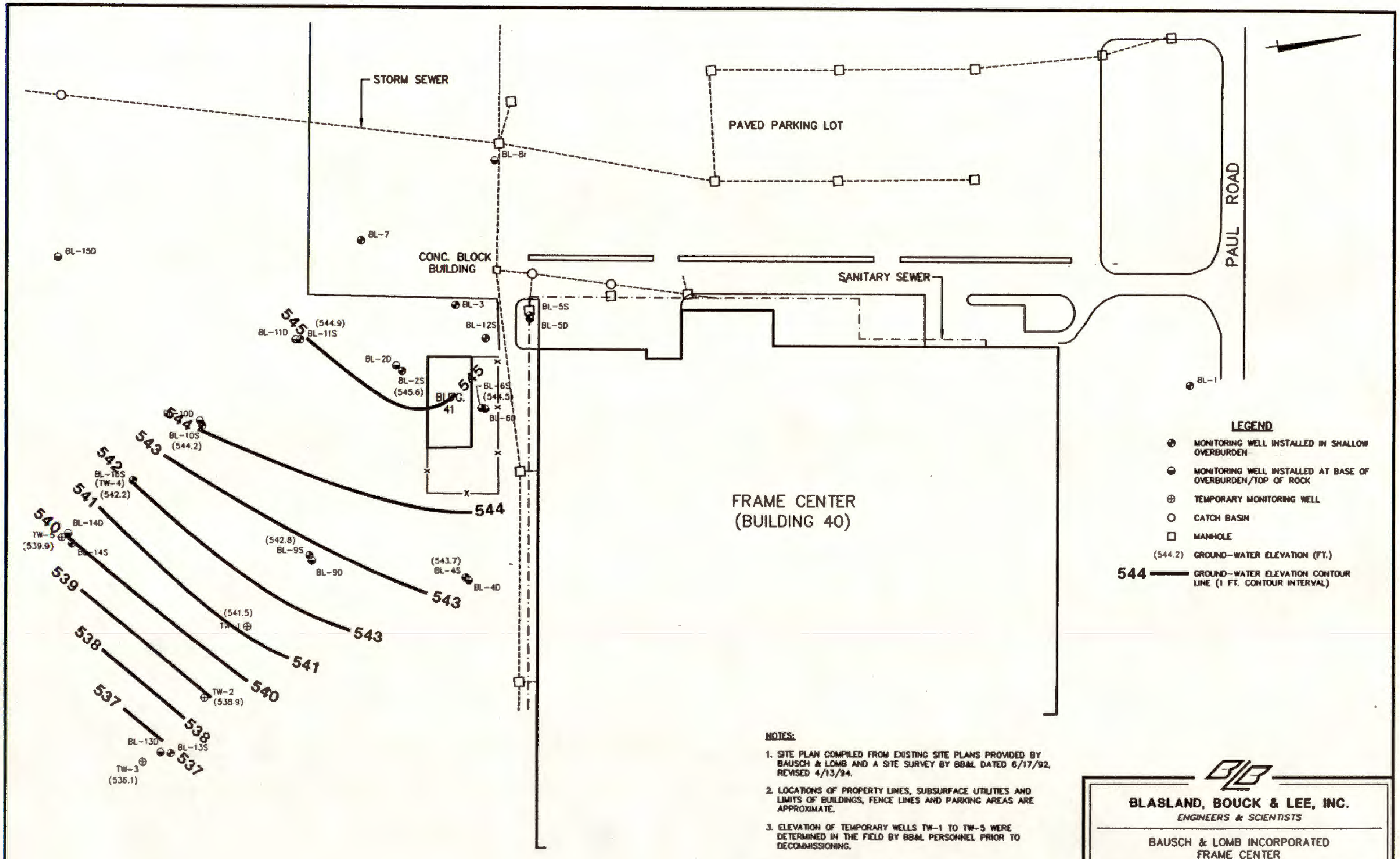
During the collection of the soil samples from the borings, samples were also collected to meet APS QA/QC requirements. Trip blanks, blind duplicates, matrix spike/matrix spike duplicates (MS/MSD), and equipment blanks were obtained and analyzed. The equipment blanks were obtained by pouring laboratory-supplied, analyte-free water through the decontaminated split-spoon sampler into laboratory-supplied containers. All samples were submitted to OBG for analysis. The following table is a summary of the samples collected and the corresponding QA/QC samples associated with them:

One equipment blank (EQUIP. BLK. 3-17-94) and one trip blank (TRIP BLK. 3-17-94), submitted for VOC analysis, were associated with the following soil sample collected on 3/17/94: BL-15D (30'-32') [BL-16D(28'-30')]
One trip blank (TRIP BLK. 3-18-94), submitted for VOC analysis, was associated with the following soil sample collected on 3/18/94: BL-13D (26'-28')
One trip blank (TRIP BLK. 3-21-94), submitted for VOC analysis, was associated with the following soil samples collected on 3/21/94: BL-13S (10'-12') B-4 (10'-12') B-4 (12'-14')
One trip blank (TRIP BLK. 3-23-94), submitted for VOC analysis, was associated with the following soil samples collected on 3/22/94: BL-14D (34'-36') BL-14S (18'-20')
A matrix spike/matrix spike duplicate (MS/MSD) was submitted for VOC analysis from the following soil sample collected on 3/18/94: BL-13D (26'-28')

Note:

Brackets contain blind duplicate sample identification.

QA/QC samples were not required by the RI Addendum Work Plan for the samples submitted for TOC analysis. The analysis performed by OBG were in accordance with NYSDEC ASP with Level B deliverables. The data generated by OBG were subjected to data validation performed by Galson Laboratories in Syracuse, New York. The raw analytical data package and validation was provided to the NYSDEC under separate cover.



NOTES:

1. SITE PLAN COMPILED FROM EXISTING SITE PLANS PROVIDED BY BAUSCH & LOMB AND A SITE SURVEY BY BB&L DATED 6/17/92, REVISED 4/13/94.
2. LOCATIONS OF PROPERTY LINES, SUBSURFACE UTILITIES AND LIMITS OF BUILDINGS, FENCE LINES AND PARKING AREAS ARE APPROXIMATE.
3. ELEVATION OF TEMPORARY WELLS TW-1 TO TW-5 WERE DETERMINED IN THE FIELD BY BB&L PERSONNEL PRIOR TO DECOMMISSIONING.

SCALE: 100' 0 100'

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK

SHALLOW OVERBURDEN GROUND-WATER ELEVATION CONTOURS - MARCH 18, 1994 PARTIAL SITE COVERAGE

FIGURE **A-1.1**

GW3S
6/20/94 SY-DMW
34205431/34205BM4.DWG

APPENDIX A-2

Water-Level Gauging

Two rounds of water levels were obtained from all of the on-site monitoring wells. Water levels were also determined at the three stainless-steel well points and the two surface water gauging points in the SSA. The first round of water levels were obtained during the ground-water sampling event on April 10, 1994. To evaluate potential seasonal fluctuations in water levels at the site, a second round was completed approximately three months after the first round on July 12, 1994.

Depths to water in the monitoring wells were determined and referenced to the top of the well's riser pipe, using an electronic water level indicator. The probe portion of the indicator was decontaminated after each use by means of an Alconox solution spray, a 10 percent methanol spray, followed by a final distilled water rinse. For the purpose of comparing ground-water elevations in the monitoring wells, the elevation of the top of the riser pipe of each newly installed monitoring well was determined to the nearest hundredth of a foot by licensed BB&L surveyors in April 1994. A summary of the ground-water elevations is provided in Table 2.

APPENDIX A-3

Well Development and Hydraulic Conductivity Testing

During March 24 through 30, 1994, all newly installed monitoring wells were developed to enhance the hydraulic communication between the well screen and surrounding formation. A 1.5-inch-diameter bottom-loading, stainless-steel bailer was used for development. The procedure entailed placing the bailer in the well near the top of the screened interval and then rapidly moving the bailer up and down within the screened interval in an attempt to loosen trapped sediments from the screen, sand pack, and borehole wall. The wells were periodically bailed to draw formation water into the well and to remove accumulated sediment. All purge water was containerized in 55-gallon drums and stored on-site. The initial turbidity of the bailed water ranged from moderate to high, but decreased as development proceeded.

In-situ hydraulic conductivity tests were performed using each newly installed monitoring well, to estimate the hydraulic conductivity of the formation surrounding the screened interval. After initial development of each well, an initial rising head in-situ hydraulic conductivity test was performed (Test 1). Following the initial test, further development was performed, after which a second rising head in-situ hydraulic conductivity test was conducted (Test 2). As required by the May 1990 RI Work Plan, testing and development continued until the calculated hydraulic conductivity estimated was within one order of magnitude of the previous test. A summary of the development-related hydraulic conductivity test results is provided below. Based on this information, the newly installed monitoring wells were developed to the specifications outlined in the RI Work Plan.

Well	Test 1 3/28/94	Test 2 3/30/94
BL-8S	5.3×10^{-5}	4.2×10^{-5}
BL-13S	2.1×10^{-4}	1.2×10^{-4}
BL-13D	3.9×10^{-5}	3.3×10^{-5}
BL-14S	8.1×10^{-6}	1.8×10^{-5}
BL-14D	2.4×10^{-4}	2.0×10^{-4}
BL-15D	7.0×10^{-4}	4.5×10^{-4}
BL-16S	5.3×10^{-5}	5.4×10^{-5}

Note: Values reported in cm/sec.

On April 20, 1994, a final test was performed on all of the newly installed wells. Supplemental in-situ hydraulic conductivity testing was also performed using existing wells BL-4D and BL-5D, as testing previously conducted at these wells was insufficient to adequately establish an estimate of the hydraulic conductivity. Table 3 summarizes the results of the final tests. Depending on the anticipated hydraulic conductivity of the formation surrounding the screened interval, two methods of hydraulic conductivity testing were utilized. Each of these methods involved creating a head change in the water within the well and monitoring the water level as it returned to static. The first method, which was implemented on all of the newly installed wells, involved lowering a stainless-steel bailer with a known volume into the water column of the well to be tested. After the water level returned to the static level, the bailer was rapidly removed to create a nearly instantaneous head change. The rate of recovery of the water level in the well was then measured periodically with an electronic water level probe.

The second method, which was used on existing wells BL-4D and BL-5D, involved the use of a pneumatic device to depress the water within the well and a data logger with pressure transducers. An air-tight well-head assembly was secured to the top of the well riser, and air was pumped into the headspace of the well, depressing the water level in the well. An air pressure gauge, calibrated in inches of water, was used to determine the water level displacement and to verify that the system had equilibrated prior to the release of the air pressure. To initiate the test, a ball valve in the well-head assembly was rapidly opened, enabling the pneumatic pressure in the headspace of the well to equilibrate with the atmosphere, creating an instantaneous head change in the well. A Hermit 2000 data logger with a 10 psi pressure transducer was used to collect the data as the water level rebounded to static state.

The data were evaluated using the Bouwer-Rice methodology that is applicable to partially- and fully-penetrating wells in an unconfined aquifer (Bouwer and Rice, 1976; Bouwer, 1989). This method assumes that the recovery of a well following a change in the water level in the well occurs by flow from the formation to the well or vice versa, depending on whether the water level in the well was lowered or raised at the start of the test. The data that are used for Bouwer-Rice analysis should be restricted to the data collected shortly after the creation of the head change in the well. Rapid initial recovery, however, corresponding to the response of the sandpack, is commonly seen in recovery curves that are generated by wells that are installed with a sandpack surrounding the screen. Therefore, the valid data do not necessarily occur immediately at the commencement of recovery. Head change versus time data are plotted semilogarithmically; the valid data define a straight line whose slope is proportional to the hydraulic conductivity of the formation.

For each monitoring well, the final test result is considered to be representative of the hydraulic conductivity of the formation near the monitoring well screen. The hydraulic conductivity computation summary sheets, along with the raw test data recovery curves for each tested well, are provided in Appendix D.

TABLE 1

Bausch & Lomb Frame Center
Chili, New York

Temporary Well Construction Details [1]

Location	Total Depth (Ft.)	Screen Interval (Ft.)	Sand Pack Interval (Ft.)
TW-1	10.0	1.0 - 10.0	1.0 - 10.0
TW-2	10.0	2.0 - 10.0	1.0 - 10.0
TW-3	10.0	1.0 - 10.0	0.5 - 10.0
TW-4	14.3	4.4 - 14.1	2.3 - 14.3
TW-5	10.0	2.0 - 10.0	1.0 - 10.0

Notes:

(1) Temporary wells were constructed of 2-inch-diameter, Schedule 40 PVC, with 0.010-inch screen. Grade 00 Ricci quartz sand was used for the sandpack.

(2) Temporary well TW-4 was completed as a permanent well, designated as BL-16S.

APPENDIX A-4

Shallow Soil Sampling Area Activities

The RI Addendum Work Plan presented the details of a proposed supplemental soil gas survey that was to be completed in the area southeast of Building 41. The objectives of this supplemental soil gas survey were:

1) To determine the northern, eastern, and southern limits of the soil gas anomaly observed during previous investigations in the area; and

2) To obtain compound-specific, 10 to 100 parts per billion (ppb) detection limit data on the soil gas from the survey area.

During preliminary site investigation initiation activities on December 9, 1993, depth to ground water at monitoring well clusters BL-9 and BL-10 was determined. Based on this information, the depth to ground water in the area of the proposed soil gas survey was approximately 0.5 feet below grade. The limited thickness of the unsaturated zone precluded the completion of a soil gas investigation under these conditions. Following a series of correspondence between Bausch & Lomb (January 10, 1994) and the NYSDEC (February 11, 1994), an agreement was reached that soil sampling would be substituted for the soil gas survey. The soil sampling program was to include:

- Obtaining soil samples at each of the previously proposed soil gas sampling locations;

- Each soil sample was to be a composite of the soil from ground surface to 6 inches below grade;

- At each location, two samples were to be obtained, one for potential submittal for chemical analysis and the other for headspace screening using a PID;

- Based on the headspace screening results and the geographic distribution, 75 percent of the samples obtained for chemical analysis were to be submitted to the laboratory for chemical analysis;

- If, after review of the analytical results, samples obtained from the perimeter of the sampling area were above background concentration, additional samples were to be obtained beyond the limits of the pre-established grid system. This iterative process would continue until background concentrations were reached along the perimeter; and

- Following completion of the soil sampling and analysis program, the required information regarding the concentration of VOCs in air would be modeled from the soil analytical data obtained during this investigation.

On February 28, 1994, BB&L initiated the collection of soil samples in the shallow soil sampling area. The sample points were located on a 25-foot grid sampling pattern established in the field. At each sample point, two soil samples were collected from the ground surface to an approximately 6-inch depth interval. The samples were obtained by first loosening the frozen soil utilizing a decontaminated steel crow-bar. Once loosened, a portion of the soil was placed into a laboratory-supplied container for possible laboratory analysis, and another portion was placed into a "Zip-Loc" bag for future headspace analysis. Sterile surgical gloves were worn during the collection of the samples and were changed prior to collection of each subsequent sample. The crow-bar was decontaminated prior to each use by an Alconox scrub, followed by a 10 percent methanol spray and a distilled water rinse.

The soil samples collected in the "Zip-Loc" bags were allowed to equilibrate to room temperature, at which time headspace screening was conducted. The screening was performed utilizing a HNU photoionization detector (PID) equipped with a 10.2 eV lamp. The PID was calibrated daily for a 1:1 response to a 100 ppm concentration of isobutylene gas. The probe of the PID was placed into each "Zip-Loc" bag and a headspace reading was obtained. The following table summarizes the PID headspace results:

Sample Coordinate	PID Results (ppm)	Sample Coordinate	PID Results (ppm)	Sample Coordinate	PID Results (ppm)
-25, 00*	0.0	-50, 150*	0.5	-100, 75*	0.0
-25, 25*	1.0	-50, 175*	0.1	-100, 100	0.0
-25, 50*	0.1	-50, 200*	0.0	-100, 125*	0.0
-25, 75	0.0	-75, 0*	0.1	-100, 150*	0.1
-25, 100*	0.1	-75, 25*	0.5	-100, 175*	0.5
-25, 125	0.0	-75, 50*	0.5	-100, 200*	0.1
-25, 150*	0.1	-75, 75	0.1	0, 75*	0.1
-25, 175*	0.0	-57, 100*	0.5	0, 100*	0.1
-25, 200*	2.0	-75, 125	0.0	0, 125	0.0
-50, 00*	0.0	-75, 150*	0.1	0, 150*	0.1
-50, 25	0.0	-75, 175*	0.5	25, 75*	0.0
-50, 50	0.0	-75, 200	0.0	25, 100*	0.1
-50, 75*	0.1	-100, 0*	0.1	25, 125*	0.0
-50, 100	0.0	-100, 25*	0.0	50, 75	0.0
-50, 125*	0.5	-100, 50	0.0	50, 100*	0.0

Note:

* Indicates sample submitted for laboratory analysis.

To not bias the geographic distribution of the soil samples submitted to just one portion of the area, the area was segmented into ten sampling groups as shown on Figure A-4.1 of this appendix. Within each sampling group, 75 percent of the samples were submitted to OBG Laboratories in Syracuse, New York, for VOC analysis using NYSDEC ASP Method 8010/8020, based on geographic distribution and the highest PID reading for each group.

Laboratory analysis for field samples was completed on a rush turnaround basis, with verbal results reported approximately one week after the time of submittal. The verbal results indicated that the extent of the VOCs in the southeastern portion of the sample grid had not been completely delineated. On March 11, 1994, additional soil sampling was performed in this area. The additional soil sampling points were established in the southeastern portion using the same grid spacing and pattern as previously described. Soil samples were collected and screened in the same manner as above. The following is a summary of the additional samples collected and the headspace screening results:

Sample Coordinate	PID Results (ppm)	Sample Coordinate	PID Results (ppm)	Sample Coordinate	PID Results (ppm)
0, 225	0.0	-125, 175	0.5	-150, 175	0.0
-25, 225	0.5	-125, 200	0.0	-150, 200	0.1
-50, 225	0.1	-125, 150	0.0	-150, 225	0.1
-75, 225	0.1	-150, 150	0.0	0, 250*	NA
-125, 225	0.0	-125, 125	0.1	-25, 250*	NA

<u>Notes</u>:

All of the above samples were submitted for laboratory analysis.
* Collected on March 23, 1994.

During the collection of the soil samples from the shallow sample area, samples were also collected for quality assurance/quality control (QA/QC) requirements. Trip blanks, blind duplicates, matrix spike/matrix spike duplicates (MS/MSD), and equipment blanks were obtained. The equipment blanks were obtained by pouring laboratory-supplied analyte-free water over the decontaminated steel crow-bar, which was used to loosen the soil, and over a pair of sterile surgical gloves. The water was collected in laboratory-supplied containers. The following table is a summary of the samples collected and the corresponding QA/QC samples associated with each:

Two equipment blanks (EQUIP. BLK. 2-28-94 and EQUIP. BLK. 2-28-94) and one trip blank (TRIP BLK. 2-28-94), submitted for VOC analysis, were associated with the following soil samples collected on 2/28/94:

-25, 200	-75, 0	-50, 125	0, 100
-50, 200	-50, 0	-50, 150	0, 150
-100, 200	-25, 0	-50, 175	25, 75
-100, 175	-25, 25	-75, 25	25, 100
-100, 150	-25, 50	-75, 50 (DUPE 1)	25, 125
-100, 125	-25, 100	-75, 100	50, 100
-100, 75	-25, 150	-75, 150	
-100, 25	-25, 175	-75, 175	
-100, 0	-50, 50	0, 75 (DUPE 2)	

One equipment blank (EQUIP. BLK. 3-11-94) and one trip blank (TRIP BLK. 3-11-94), submitted for VOC analysis, were associated with the following soil samples collected on 3/11/94:

0, 225 (DUPE 1)	-125, 175	-150, 175
-25, 225	-125, 200	-150, 200
-50, 225	-125, 150	-150, 225
-75, 225	-150, 150	
-125, 225	-125, 125	

One trip blank (TRIP BLK. 3-23-94), submitted for VOC analysis, was associated with the following soil samples collected on 3/23/94:

0, 250
-25, 250

Matrix spike/matrix spike duplicates (MS/MSD) were submitted for VOC analysis from the following soil samples collected on 2/28/94:

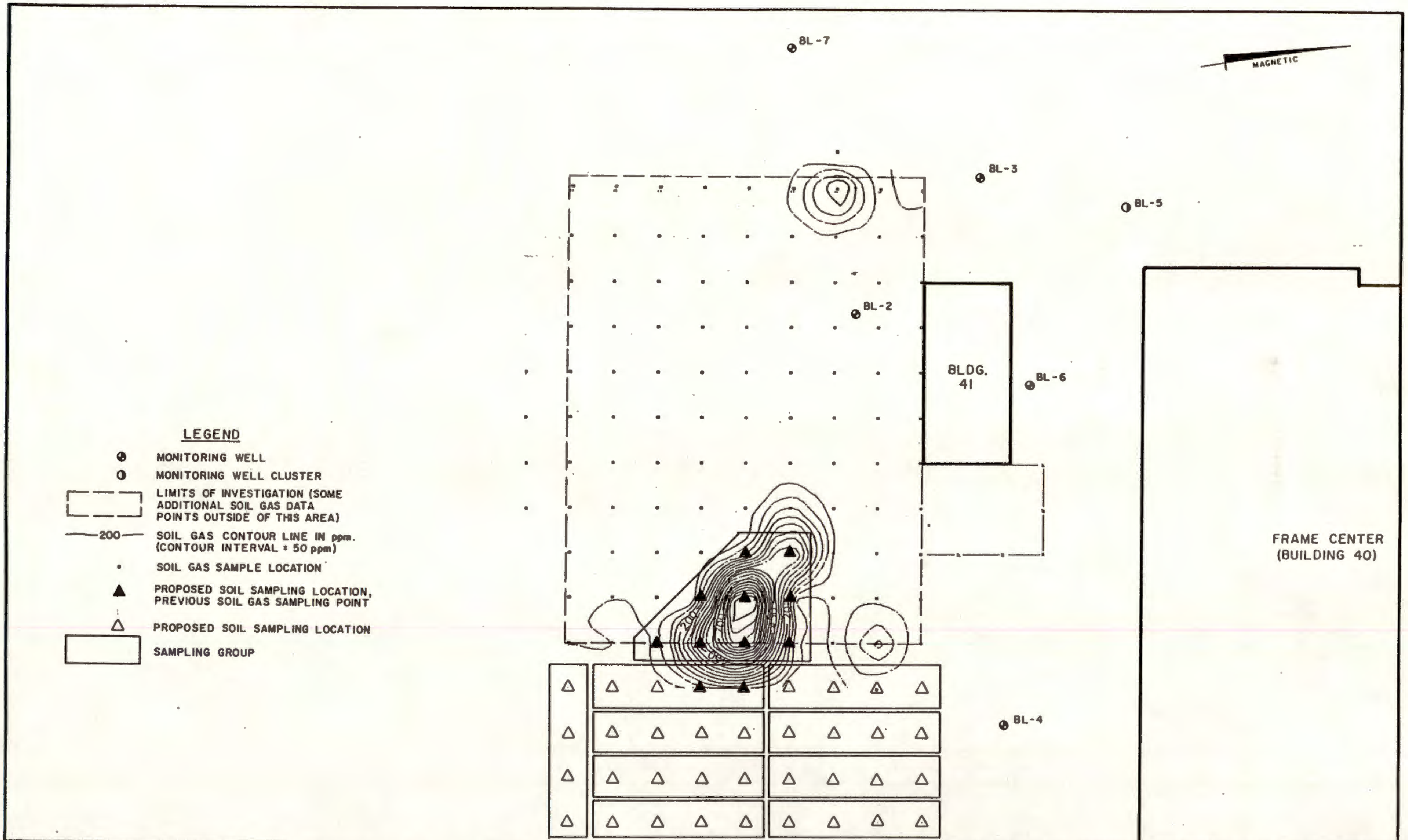
-75, 50
0, 75

A MS/MSD was also submitted from the following soil sample collected on 3/11/94:

-25, 225

Note: Parenthesis contain blind duplicate sample identification.

The analyses performed by OBG were in accordance with NYSDEC ASP with Level B deliverables. The data generated by OBG was subjected to data validation performed by Galson Laboratories in Syracuse, New York. The raw analytical data package and validation was provided to the NYSDEC under separate cover.



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In charge of
Designed by
Drawn by
Checked by

BLASLAND & BOUCK ENGINEERS, P.C.
Syracuse, New York
White Plains, New York

BAUSCH & LOMB INCORPORATED
FRAME CENTER
CHILI, NEW YORK

SOIL SAMPLING GROUPS

File No. 342.01
Date AUGUST 1991
REVISED JAN. 1994
Figure Number **A-4.1**

APPENDIX A-5

Topsoil Pile Sampling

On March 31, 1994, the two topsoil piles located south of the main production building were sampled. A total of nine soil samples per pile, consisting of both discrete and composite samples, were submitted for chemical analysis. Each pile was sampled in a manner defined in the RI Work Plan Addendum and as described below. The soil samples obtained during the sampling of these piles were analyzed for volatile organic compounds (VOCs) by Method 8010/8020 including Freon 113, and the eight site-specific metals, consisting of cadmium, chromium, lead, mercury, nickel, silver, vanadium, and zinc. The samples were submitted to OBG Laboratories (OBG) in Syracuse, New York. The sampling procedure was as follows:

- The approximate center of each pile was established, and the pile was divided into four quadrants, with the major axis oriented along the long axis of the pile and the minor axis perpendicular to the major axis.

- Three sampling locations were established per quadrant. The locations were determined using a random number generator to achieve a compass bearing and distance, in feet, from the pile's center. The random numbers used were chosen in sequence. Only the numbers which allowed for a sample point to lie on the pile was used. The random numbers generated and corresponding sample locations are provided on Table A-5.1 of this appendix.

- At each sample location, a soil sample was obtained by manually driving a decontaminated 2-foot-long, 2-inch-outside-diameter, split-spoon sampler perpendicular to the surface to a depth of 2-feet below grade. The decontamination procedure consisted of an Alconox solution scrub, followed by a 10 percent nitric acid spray, a 10 percent methanol spray, and a final distilled water rinse.

- The first two samples per quadrant were collected as discrete samples and were analyzed for VOCs and for the eight site-specific metals. The discrete soil samples were transferred directly from the split-spoon sampler into sample containers supplied by the laboratory, with the sample for VOCs removed from the samples first and containerized before the sample for the metals was removed and containerized. The third sample per quadrant was composited with the respective composite sample from each of the remaining three quadrants in the pile and analyzed for the eight site-specific metals. Approximately equal volumes of soil collected for the composite samples were initially placed in a new "Zip-Loc" bag and thoroughly mixed. The soil was then transferred into the appropriate sample containers supplied by OBG.

To meet NYSDEC ASP quality assurance/quality control (QA/QC) requirements, trip blanks, blind duplicates, matrix spike/matrix spike duplicates (MS/MSDs), and equipment blanks were collected and submitted for chemical analysis. The equipment blank was collected by pouring laboratory-analyte-free water through the decontaminated split-spoon sampler into laboratory-supplied containers. All samples were submitted to OBG for analysis. The following table is a summary of the samples collected and the corresponding QA/QC samples associated with them.

One equipment blank (EQUIP. BLK. 3-31-94) and one trip blank (TRIP BLK. 3-31-94), submitted for VOC analysis, were associated with the following soil samples collected on 3/31/94:			
P1-1 (DUPE A)	P1-7	P2-1	P2-7
P1-2	P1-8	P2-2	P2-8
P1-4	P1-10	P2-4	P2-10
P1-5	P1-11	P2-5	P2-11
One equipment blank (EQUIP. BLK 3-31-94), submitted for inorganic analysis, was associated with the following soil samples collected on 3/31/94:			
Comp P1	P1-7	Comp P2	P2-7
P1-1 (DUPE A)	P1-8	P2-1	P2-8
P1-2	P1-10	P2-2	P2-10
P1-4	P1-11	P2-4	P2-11
P1-5		P2-5	
A matrix spike/matrix spike duplicate (MS/MSD) was submitted for VOC and inorganic analysis for the following soil sample collected on 3/31/94:			
	P1-7		

Note:

Parenthesis contain blind duplicate sample identification.

The analyses performed by OBG were in accordance with NYSDEC ASP with Level B deliverables. The data generated by OBG was subjected to data validation performed by Galson Laboratories in Syracuse, New York. The raw analytical data package and validation was provided to the NYSDEC under separate cover.

APPENDIX A-6

Ground-Water Sampling

Temporary Well Sampling

On March 16, 1994, BB&L collected ground-water samples from the five temporary monitoring wells (TW-1 through TW-5) as shown on Figure 3. A second ground-water sample was collected and analyzed from TW-4 on March 18, 1994, which was used to confirm the elevated volatile organic compound (VOC) results previously detected from that monitoring point. As detailed in the RI Addendum Work Plan, only rudimentary development of the temporary wells was performed. Following this development, a decontaminated stainless-steel bailer on a length of new polypropylene rope was used to collect the ground-water samples. Bailer decontamination consisted of an Alconox solution scrub, followed by a 10 percent methanol spray and a final distilled water rinse. The ground-water samples were hand delivered to General Testing Company in Rochester, New York, for rapid turnaround VOC and Freon 113 analyses. The collection of quality assurance/quality control (QA/QC) samples (i.e., trip blanks, equipment blanks, etc.) was not required as stated in RI Addendum Work Plan.

The analytical data generated from the ground-water samples collected from the temporary wells were used for a screening device to aid in the placement of the permanent monitoring well clusters. The two well clusters BL-13 and BL-14 were installed downgradient of the location where the concentration of VOCs indicated that the outer extent of the VOC-containing ground-water plume had been reached. The analytical data from temporary wells TW-3 and TW-5, which were the two most downgradient wells along the temporary well lines, confirmed that the outer portion of the VOC-containing ground-water plume in the shallow overburden was delineated. The total VOC concentration in ground-water sample TW-5 was 3.3 parts per billion (ppb), and the total VOC concentration in TW-3 was non-detect. After the installation of permanent well BL-14S, a ground-water sample was collected from this well in the same manner as described above and submitted to General Testing Company for a rapid turnaround VOC analysis. This was necessary to confirm that the outer extent of the shallow overburden VOC-containing ground-water plume in the BL-14 area had been reached, since, as presented in the monitoring well installation discussion in Appendix A-1, BL-14S was installed somewhat deeper than the TW-5 previously installed in this area. The total VOC concentration of the ground-water sample collected from BL-14S was 1.5 ppb.

The bases of overburden/top of rock "D" wells were installed at the edge of the VOC-containing ground-water plume. Ground-water samples were collected from BL-13D, BL-14D, and BL-15D in the same manner as previously described and submitted to General Testing Company for rapid turnaround VOC analysis. This was performed while the drill rig was on site in the event that additional "D" well(s) would be required further downgradient to define the VOC-containing ground-water plume. The installation of additional wells was not necessary based on the analytical results. The total VOC concentration at BL-14D was 2.1 ppb. No VOCs were detected at BL-13D and BL-15D.

A summary of the VOCs detected in the ground-water samples collected from the temporary wells and from the BL-13D, BL-14D, and BL-15D is presented below:

Compound	TW-1	TW-2	TW-3	TW-4	TW-5	BL-13D	BL-14S	BL-14D	BL-15D
1,1-Dichloroethene	--	--	--	900.0	--	--	--	--	--
1,2-Dichloroethene (cis & trans)	32.0	15.0	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	2.2	1.5	2.1	--
1,2-Dichloroethane	1.5	--	--	--	--	--	--	--	--
Bromodichloromethane	--	--	--	--	1.1	--	--	--	--
Trichloroethene	1.5	29.0	--	--	--	--	--	--	--
Tetrachloroethene	--	--	--	150.0	--	--	--	--	--
Total VOCs	35.0	44.0	--	1050.0	3.3	--	1.5	2.1	--

Note: Concentrations represented in ppb (ug/L).
-- Indicates not detected.

Monitoring Well Sampling

BB&L obtained ground-water samples from each of the new and existing monitoring wells on April 11 and 12, 1994, to evaluate the presence of VOCs in the ground water at the well locations. Prior to sampling, the static level of water in each well was determined using an electronic water level indicator, and the volume of water in the well was calculated. The well was then purged of a minimum of three well volumes of water using a decontaminated stainless-steel, bottom-loading bailer, which was lowered into the well on a length of new polypropylene rope. Bailer decontamination was performed prior to each use in the manner previously described. Immediately following well purging, the samples were obtained using the same bailer as was used for the purging and submitted to OBG Laboratories (OBG) in Syracuse, New York.

The following table summarizes the sampling parameters obtained during the April 1994 sampling event:

Well	Well Volume (gal)	Volume Purged (gal)	pH	Temperature (°C)	Specific Conductance (mS/cm)
BL-1	4.7	14.0	7.8	8.4	1.30
BL-2S	2.1	6.3	6.9	8.0	0.980
BL-2D	4.0	12.0	7.3	9.8	0.950
BL-3	3.6	10.8	6.6	7.5	4.30
BL-4S	2.1	6.3	6.9	7.9	1.22
BL-4D	5.3	16.0	7.0	8.2	2.21
BL-5S	2.0	6.0	7.3	7.9	1.12
BL-5D	4.4	13.2	7.3	8.8	0.720
BL-6S	2.7	8.0	7.7	9.4	1.30
BL-6D	5.0	15.0	7.1	10.1	0.728
BL-7	2.8	8.3	7.5	8.1	2.47
BL-8r	3.9	11.7	7.7	7.9	2.46
BL-9S	2.6	7.8	7.1	6.8	0.990
BL-9D	6.0	18.0	6.9	9.7	1.08
BL-10S	2.3	6.9	7.0	7.6	0.820
BL-10D	6.7	20.0	6.9	11.7	1.16
BL-11S	2.3	6.9	6.8	7.3	1.63
BL-11D	4.3	13.0	6.8	9.5	2.25
BL-12S	2.2	6.4	7.2	8.9	1.58
BL-13S	2.0	6.0	7.0	9.0	2.11
BL-13D	5.2	15.6	7.1	8.7	1.94
BL-14S	4.0	12.0	7.1	8.2	0.980
BL-14D	6.0	18.0	7.2	8.9	1.11
BL-15D	6.2	18.6	7.0	9.4	1.72
BL-16S	2.3	6.9	6.8	8.4	1.74

As part of the ground-water sampling activities, samples were also collected to fulfill ASP quality assurance/quality control (QA/QC) requirements. Trip blanks, blind duplicates, matrix spike/matrix spike duplicates (MS/MSDs), and equipment blanks were obtained and submitted for chemical analysis. The equipment blanks were obtained by pouring laboratory-supplied, analyte-free water through the decontaminated stainless-steel bailer and into laboratory-supplied containers. The ground-water and QA/QC samples were submitted to OBG for VOC analysis using Method 8010/8020 extended to include Freon 113. The following is a summary of the samples collected and the corresponding QA/QC samples associated with them:

One equipment blank (EQUIP. BLK. 4-11-94) and one trip blank (TRIP BLK. 4-11-94), submitted for VOC analysis, were associated with the following ground-water samples collected on 4/11/94:

BL-2S	BL-4D	BL-6D	BL-10D
BL-2D	BL-5S	BL-9S	BL-11S
BL-3	BL-5D (DUPE 21S)	BL-9D	BL-11D
BL-4S	BL-6S (DUPE 20S)	BL-10S	BL-12S

One equipment blank (EQUIP. BLK. 4-12-94) and one trip blank (TRIP BLK. 4-12-94), submitted for VOC analysis, were associated with the following ground-water samples collected on 4/12/94:

BL-1	BL-13S	BL-14D
BL-7	BL-13D	BL-15D
BL-8r	BL-14S	BL-16S

A matrix spike/matrix spike duplicate (MS/MSD) was submitted for VOC analysis from the following ground-water samples collected on 4/11/94:
BL-5S
BL-6D

Note:

Parenthesis contain blind duplicate sample identification.

The analyses performed by OBG were in accordance with NYSDEC ASP with Level B deliverables. The data generated by OBG were subjected to data validation performed by Galson Laboratories in Syracuse, New York. The raw analytical data package and validation was provided to the NYSDEC under separate cover.

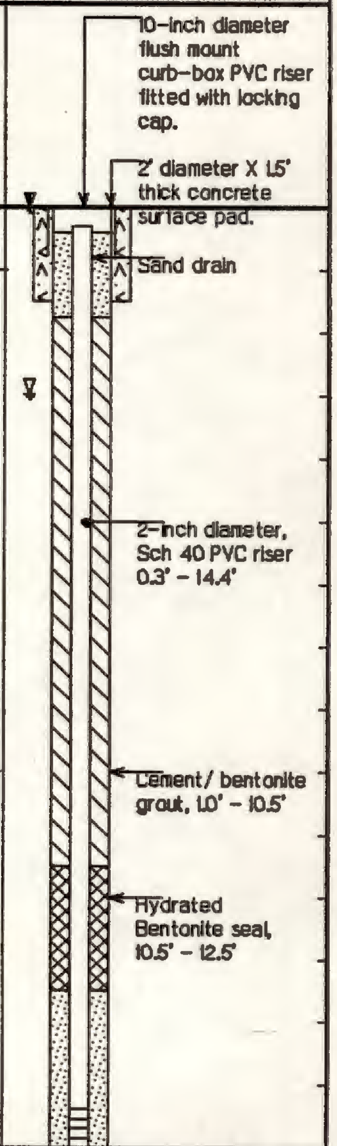
APPENDIX B

Subsurface Logs

Date Start/Finish: 3/24/94 – 3/24/94 **Drilling Company:** Nothnagle Drilling **Driller's Name:** Roger Bower **Drilling Method:** Hollow Stem Auger **Bit Size:** NA–in. **Auger Size:** 4 1/4–in. ID **Rig Type:** CME – 57 **Spoon Size:** 2–in. O.D. **Hammer Weight:** 140–lb **Height of Fall:** 30–in.	**Northing:** **Easting:** **Well Casing Elev.:** 543.72 ft. **Corehole Depth:** NA ft. **Borehole Depth:** 24.3 ft. **Ground Surface Elev.:** 544.0 ft. **Geologist:** David L. Greene	**Well No.** BL-8r **Site:** Bausch & Lomb Frame Center Chili, New York **Client:** Bausch & Lomb

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description
	gs elevation 544.0 ft									GROUND SURFACE
										ASPHALT pavement and gravel underlayment.
		1			22	1.4				Gray to brown CLAY interbedded with SILT grading to fine SAND interbedded with CLAY, little fine gravel, dry.
	540	2			40	1.7				
5		3			95	1.8				
		4			100	1.1				
	535									Brown fine SAND, wet with laminations, little to trace CLAY, coarse to fine gravel, coarse clast 11.3'.
10		5			130	1.2				
		6			100	.4				
		7			200	1.1				Fine SAND little silt, trace coarse gravel, moist.
	530									
15										

Well Construction



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Remarks:

Water Levels		
Date / Time	Elevation	Depth
4-10-94	543.70	0.02
7-12-94	541.06	2.97

Project: 342.05 Script: BL-well Date: 08/12/94

Client: Bausch & Lomb

Site: Bausch & Lomb Frame Center Chili, New York

Well No. BL-8r

Total Depth = 24.3 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8			105	1.1					
		9			105	0.4					Grade 00 Ricci sand, 12.5' – 24.3'
	525									Silty CLAY, little fine sand and coarse gravel (limestone), moist.	
20		10			120	0.7				Gray-brown wheathered SHALE.	2-inch diameter, Sch 40, 10-slot PVC, screen 14.4' – 24.1'
		11			100	0.4					
		12			100	0.8					
	520										
25										Bottom of boring at 24.3 ft.	Sump 24.1' – 24.3'
	515										
30											
	510										
35											

Note: No samples were obtained during the installation of BL-8r, which is a replacement for monitoring well BL-8. Subsurface information is from the log for BL-8.

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Remarks:

Water Levels

Date / Time	Elevation	Depth
4-10-94	543.70	0.02
7-12-94	541.06	2.97

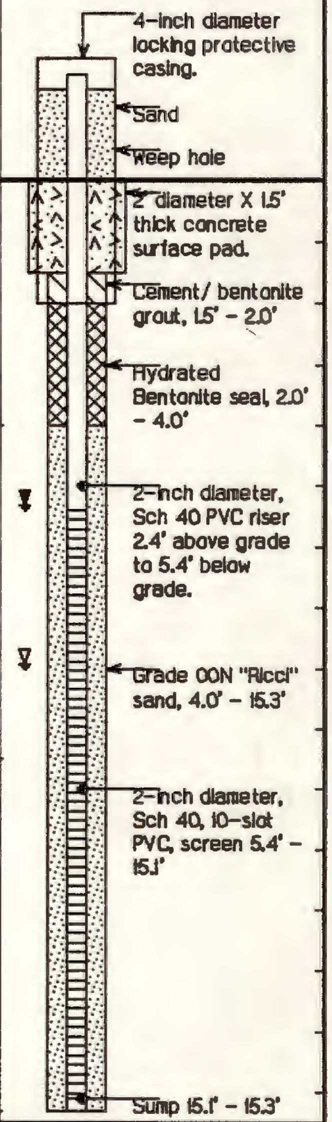
Project: 342.05

Script: BL-well
Date: 08/11/94

Date Start/Finish: 3/21/94 – 3/21/94 **Drilling Company:** Nothnagle Drilling **Driller's Name:** Roger Bower **Drilling Method:** Hollow Stem Auger **Bit Size:** NA–in. **Auger Size :** 4 1/4–in. ID **Rig Type:** CME – 57 **Spoon Size:** 2–in. O.D. **Hammer Weight:** 140–lb **Height of Fall:** 30–in.	**Northing:** **Easting:** **Well Casing Elev.:** 541.20 ft. **Corehole Depth:** NA ft. **Borehole Depth:** 15.3 ft. **Ground Surface Elev.:** 538.8 ft. **Geologist:** David L. Greene	**Well No. BL-13S** **Site:** Bausch & Lomb Frame Center Chili, New York **Client:** Bausch & Lomb

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description
gs elevation 538.8 ft										**GROUND SURFACE**
		1	/	7 8 11 11	19	1.4	0.1			Brown-dark brown, fine to medium SAND, some medium to coarse gravel and debris, (concrete, asphalt and wood pieces), medium dense, moist. FILL
	535	2	/	9 8 10 14	18	2.0	0.1			
5		3	/	7 11 5 12	16	1.7	0.0			Brown-gray SILTY medium to coarse SAND, loose, moist. Red-brown, SILTY medium SAND, trace clay, loose, moist.
		4	/	12 12 12 14	24	1.7	0.1			Gray-brown, silty fine to medium SAND, trace clay, medium dense, wet.
	530	5	/	12 21 24 24	45	1.5	0.0			Brown-red, silty fine SAND, dense, wet. Brown coarse SAND, dense, wet.
10		6	/	11 31 23 40	54	1.5	0.1			Red brown, fine to medium SAND and SILT, trace fine gravel, very dense, wet.
	525	7	/	10 12 18 28	30	1.8	0.1			
15		8	/	20 28	82	2.0	0.1			Bottom of boring at 15.3 ft.

Well Construction



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Remarks:

No sampling was performed during the instllation of BL-13S. Subsurface information is from log of BL-13D.

Water Levels

Date / Time	Elevation	Depth
4-10-94	535.87	5.33
7-12-94	533.19	7.94

Project: 342.05   Script: BL-well
Date: 08/12/94

Date Start/Finish: 3/17/94 – 3/18/94
Drilling Company: Nothnagle Drilling
Driller's Name: Roger Bower
Drilling Method: Hollow Stem Auger
Bit Size: NA-in. **Auger Size:** 4 1/4-in. ID
Rig Type: CME – 57
Spoon Size: 2-in. O.D.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Northing:
Easting:
Well Casing Elev.: 541.05 ft.
Corehole Depth: NA ft.
Borehole Depth: 35.2 ft.
Ground Surface Elev.: 539.4 ft.

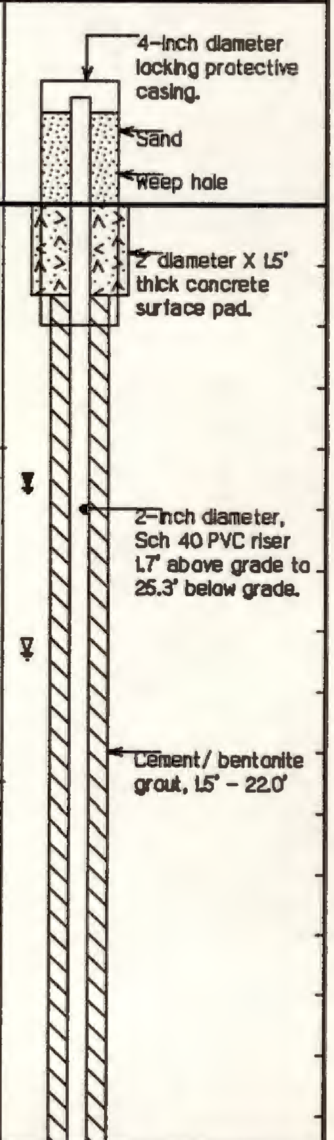
Geologist: David L. Greene

Well No. BL-13D

Site:
Bausch & Lomb Frame Center
Chili, New York
Client:
Bausch & Lomb

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description
gs elevation 539.4 ft										GROUND SURFACE
		1		7 8 11 11	19	1.4	0.1			Brown-dark brown, fine to medium SAND, some medium to coarse gravel and debris, (concrete, asphalt and wood pieces), medium dense, moist. FILL
		2		9 9 10 14	19	2.0	0.1			
5	535	3		7 11 5 12	16	1.7	0.0			Brown-gray SILTY medium to coarse SAND, loose, moist. / Red-brown, SILTY medium SAND, trace clay, loose, moist.
		4		12 12 12 14	24	1.7	0.1			Gray-brown, silty fine to medium SAND, trace clay, medium dense, wet.
	530	5		12 21 24 24	45	1.5	0.0			Brown-red, silty fine SAND, dense, wet.
10		6		11 31 23 40	54	1.5	0.1			Brown coarse SAND, dense, wet. / Red brown, fine to medium SAND and SILT, trace fine gravel, very dense, wet.
		7		10 12 18 28	30	1.8	0.1			
15	525	8		20 26 36	62	2.0	0.1			

Well Construction



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Remarks:

Water Levels

Date / Time	Elevation	Depth
4-10-94	536.38	4.87 ▽
7-12-94	533.73	7.40 ▽

Project: 342.05
Script: BL-well
Date: 08/12/94

Client: Bausch & Lomb

Site: Bausch & Lomb Frame Center Chili, New York

Well No. BL-13D

Total Depth = 35.2 ft.

Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Stratigraphic Description
8		40	62	2.0	0.1		Gray, medium SAND, some gravel, dense, wet.
9		19 34 19 38	53	1.7	0.2		Gray-brown, silty medium SAND, some fine gravel, dense, wet.
10		24 30 48 51	78	1.4	0.2		Brown-red brown, silty fine SAND, trace fine to medium gravel, very dense, compact, moist. TILL
11		28 34 34 58	68	1.7	0.1		
12		34 50 100 ---	150	1.0	0.0		
13		47 54 100 ---	154	1.1	0.0		Red-brown, silty fine to medium SAND, trace clay and fine gravel, very dense, wet.
14		59 60 99 100	159	1.8	0.2		
15		70 70 100 ---	170	0.9	0.1		Gray, fine GRAVEL and medium SAND, very dense, wet. Gray-green, fine to medium GRAVEL and SAND, some siltstone fragments, very dense, wet.
16		47 84 --- ---	---	0.9	0.1		Green-gray weathered SILTSTONE fragments.
17		75 95 100 ---	195	0.9	0.1		
18		100 100	---	0.8	0.0		Red brown SILTSTONE.
							Bottom of boring at 35.2 ft.

Depth: 20, 25, 30, 35

Elevation: 520, 515, 510, 505

Well Construction

Hydrated Bentonite seal, 22.0' - 24.0'

Grade 00N "Ricci" sand, 24.0' - 35.2'

2-inch diameter, Sch 40, 10-slot PVC, screen 25.3' - 35.0'

Sump 35.0' - 35.2'

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Remarks:

Water Levels

Date / Time	Elevation	Depth
4-10-94	536.38	4.87
7-12-94	533.73	7.40

Project: 342.05

Script: BL-well
Date: 08/11/94

Date Start/Finish: 3/24/94 - 3/24/94
Drilling Company: Nothnagle Drilling
Driller's Name: Roger Bower
Drilling Method: Hollow Stem Auger
Bit Size: NA-in. **Auger Size :** 4 1/4-in. ID
Rig Type: CME - 57
Spoon Size: 2-in. O.D.
Hammer Weight: 140-lb
Height of Fall: 30-in.

Northing:
Easting:
Well Casing Elev.: 542.12 ft.
Corehole Depth: NA ft.
Borehole Depth: 24.2 ft.
Ground Surface Elev.: 540.5 ft.

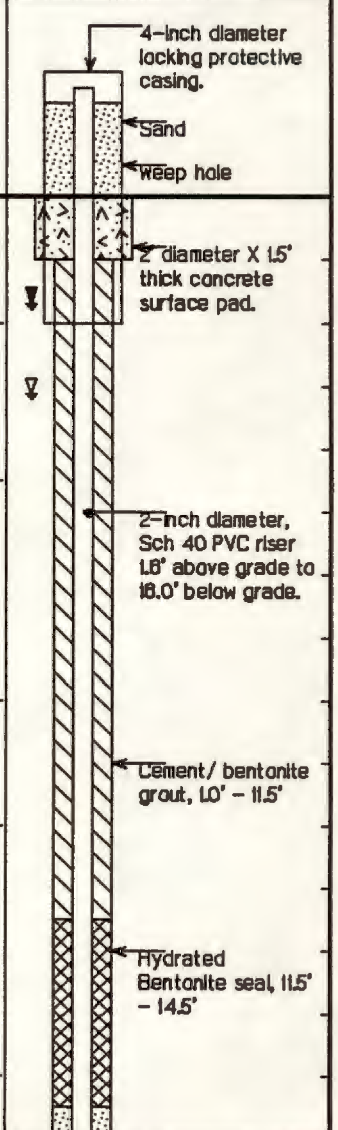
Geologist: David L. Greene

Well No. BL-14S

Site:
Bausch & Lomb Frame Center
Chili, New York
Client:
Bausch & Lomb

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description
gs elevation 540.5 ft										GROUND SURFACE
	540	1		1 1 3 4	4	1.5	0.1			Brown-dark brown, silty fine to medium SAND, some fine gravel and plant material, loose, wet.
		2		0 0 1 2	1	2.0	0.1			Brown, fine to medium SAND and SILT, trace clay and fine gravel (rounded), loose, wet.
5	535	3		9 5 20 21	25	1.5	0.2			Brown-red brown, fine to medium SAND and SILT, medium dense, wet.
		4		7 38 38 40	76	1.6	0.1			
		5		11 14 11 22	25	1.5	0.2			Brown-gray brown, fine to medium SAND and SILT, some coarse gravel (angular) medium dense, wet.
10	530	6		5 42 47 55	89	1.5	0.2			Gray-red brown medium SAND and SILT, some coarse gravel, very dense, wet.
		7		13 31 37 60	68	1.3	0.2			
15		8		24 24	52	1.8	0.3			Gray-brown, fine to medium SAND and SILT, trace fine gravel, very

Well Construction



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ENGINEERS & SCIENTISTS

Remarks:
No sampling was performed during the instllation of BL-14S. Subsurface information is from log of BL-14D.

Water Levels

Date / Time	Elevation	Depth
4-10-94	540.43	1.69
7-12-94	539.11	3.11

Project: 342.05
Script: BL-well
Date: 08/12/94

Client:
Bausch & Lomb

Site:
Bausch & Lomb Frame Center Chili, New York

Well No. BL-14S

Total Depth = 24.2 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	525	8		28 49	52	1.8	0.3			dense, wet.	
		9		14 34 40 30	74	1.5	0.5				Grade 00N "Ricci" sand, 14.5' – 24.2'
		10		19 27 32 33	59	1.5	0.5			Brown-gray, silty fine SAND, trace fine gravel, dense, wet.	
20	520	11		18 27 32 45	59	1.4	0.5				2-inch diameter, Sch 40, 10-slot PVC, screen 16.0' – 24.0'
		12		24 100 100	200	1.5	0.2			Brown-gray silty fine SAND, very dense, wet.	
25	515									Bottom of boring at 24.2 ft.	Sump 24.0' – 24.2'
30	510										
35											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth
4-10-94	540.43	1.69
7-12-94	539.11	3.11

Date Start/Finish: 3/22/94 - 3/23/94 **Drilling Company:** Nothnagle Drilling **Driller's Name:** Roger Bower **Drilling Method:** Hollow Stem Auger **Bit Size:** NA-in. **Auger Size** : 4 1/4-in. ID **Rig Type:** CME - 57 **Spoon Size:** 2-in. O.D. **Hammer Weight:** 140-lb **Height of Fall:** 30-in.	**Northing:** **Easting:** **Well Casing Elev.:** 542.44 ft. **Corehole Depth:** NA ft. **Borehole Depth:** 40.0 ft. **Ground Surface Elev.:** 540.7 ft. **Geologist:** David L. Greene	**Well No.** BL-14D **Site:** Bausch & Lomb Frame Center Chili, New York **Client:** Bausch & Lomb

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 540.7 ft.										**GROUND SURFACE**	4-inch diameter locking protective casing. Sand. Weep hole
	540	1		1 1 3 4	4	1.5	0.1			Brown-dark brown, silty fine to medium SAND, some fine gravel and plant material, loose, wet.	2' diameter X 1.5' thick concrete surface pad.
		2		0 0 1 2	1	2.0	0.1			Brown, fine to medium SAND and SILT, trace clay and fine gravel (rounded), loose, wet.	
5	535	3		9 5 20 21	25	1.5	0.2			Brown-red brown, fine to medium SAND and SILT, medium dense, wet.	2-inch diameter, Sch 40 PVC riser 1.7' above grade to 31.8' below grade.
		4		7 38 38 40	76	1.6	0.1				
		5		11 14 11 22	25	1.5	0.2			Brown-gray brown, fine to medium SAND and SILT, some coarse gravel (angular) medium dense, wet.	Cement/ bentonite grout, 1.5' - 28.0'
10	530	6		5 42 47 55	89	1.5	0.2			Gray-red brown medium SAND and SILT, some coarse gravel, very dense, wet.	
		7		13 31 37 60	68	1.3	0.2				
15		8		24 24	52	1.8	0.3			Gray-brown, fine to medium SAND and SILT, trace fine gravel, very	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth
4-10-94	537.87	4.77
7-12-94	537.58	4.80

Client:
Bausch & Lomb

Site:
Bausch & Lomb Frame Center Chili, New York

Well No. BL-14D

Total Depth = 40.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	525	8		28 49	52	1.8	0.3			dense, wet.	
		9		14 34 40 30	74	1.5	0.5				
		10		19 27 32 33	59	1.5	0.5			Brown-gray, silty fine SAND, trace fine gravel, dense, wet.	
20	520	11		18 27 32 45	59	1.4	0.5				
		12		24 100 100 ---	200	1.5	0.2			Brown-gray silty fine SAND, very dense, wet.	
25	515	13		40 82 100 ---	182	1.4	0.1			Brown-gray, silty fine SAND, trace fine gravel (rounded), very dense, compact, wet. TILL	
		14		82 100 100 ---	200	1.0	0.1				Hydrated Bentonite seal, 28.0' - 30.0'
		15		127 100 --- ---	---	0.8	0.1			Gray, silty fine to coarse SAND, some fine to medium gravel, very dense, wet.	
30	510	16		85 100 --- ---	---	0.7	0.1			Gray-dark, fine SAND, trace fine gravel, very dense, wet.	
		17		34 37 34 34	71	1.8	0.0			Green-gray, fine SAND, trace fine gravel, very dense, wet.	
35		18		31 33	74	1.6	0.2			Gray-green weathered SILTSTONE	

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels		
Date / Time	Elevation	Depth
4-10-94	537.67	4.77
7-12-94	537.59	4.80

Project: 342.05

Script: BL-well
Date: 08/11/94

Client:
Bausch & Lomb

Site:
Bausch & Lomb Frame Center Chili, New York

Well No. BL-14D

Total Depth = 40.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	505	18		41 38	74	1.6	0.2			Brown, medium to coarse SAND and weathered SILTSTONE fragments, wet.	Grade 00N "Ricci" sand, 30.0' - 39.8'
		19		34 33 30 100	63	1.5	0.2			Red-brown SILTSTONE fragments.	
		20		64 100	---	1.0	0.2			Green-gray, SILTSTONE.	2-inch diameter, Sch 40, 10-slot PVC, screen 31.8' - 39.8'
40										Bottom of boring at 39.8 ft.	Sump 39.8' - 39.8'
	500										
45											
	495										
50											
	490										
55											

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

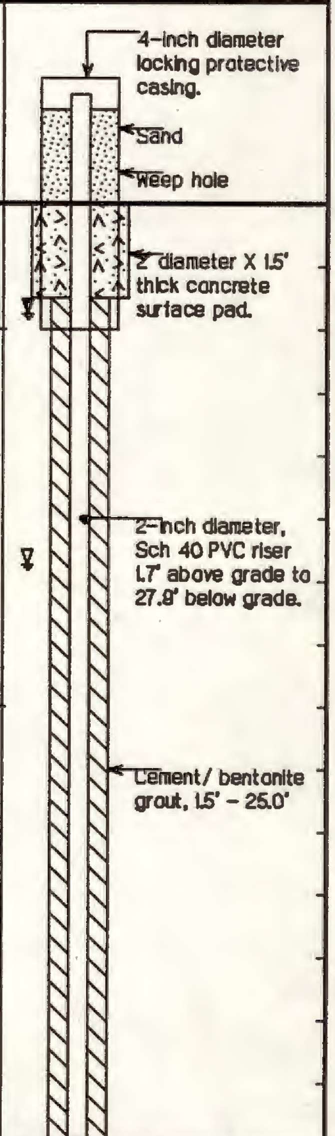
Water Levels

Date / Time	Elevation	Depth
4-10-94	537.87	4.77
7-12-94	537.59	4.80

Date Start/Finish: 3/16/94 – 3/17/94 **Drilling Company:** Nothnagle Drilling **Driller's Name:** Roger Bower **Drilling Method:** Hollow Stem Auger **Bit Size:** NA-in. **Auger Size** : 4 1/4-in. ID **Rig Type:** CME – 57 **Spoon Size:** 2-in. O.D. **Hammer Weight:** 140-lb **Height of Fall:** 30-in.	**Northing:** **Easting:** **Well Casing Elev.:** 546.12 ft. **Corehole Depth:** NA ft. **Borehole Depth:** 37.8 ft. **Ground Surface Elev.:** 544.4 ft. **Geologist:** David L. Greene	**Well No.** BL-16D **Site:** Bausch & Lomb Frame Center Chili, New York **Client:** Bausch & Lomb

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description
	gs elevation 544.4 ft.									GROUND SURFACE
		1		1 2 5 7	7	1.0	0.0			Brown-dark brown, fine to medium SAND and SILT, some fine gravel and plant material (roots, grass), loose, moist.
		2		7 8 15 18	23	1.5	0.0			Brown, silty medium SAND, trace clay, medium dense, moist.
5	540	3		9 9 13 20	22	2.0	0.2			Brown-redbrown, fine SAND and SILT, trace fine gravel and coarse sand, medium dense, wet.
		4		6 10 19 28	29	1.8	0.0			
	535	5		13 34 37 50	71	1.5	0.1			Brown-gray, silty fine SAND, trace clay and fine gravel, very dense, wet.
10		6		10 34 50 52	84	2.0	0.5			Gray, silty fine SAND, some clay, very dense, moist.
		7		14 32 47 54	79	1.8	0.5			
15	530	8		14 16	60	1.5	0.2			

Well Construction



BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth
4-10-94	544.38	1.78
7-12-94	540.44	5.73

Project: 342.05 Script: BL-well Date: 08/12/94

Client: Bausch & Lomb

Site: Bausch & Lomb Frame Center Chili, New York

Well No. BL-16D

Total Depth = 37.8 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		8		44 44	80	1.5	0.2				
		9		21 31 57 70	88	2.0	0.0				
	525	10		33 40 51 65	91	1.4	0.0			Gray-brown, silty fine SAND, some clay, trace fine gravel (rounded), very dense, wet.	
20		11		18 40 60 102	100	1.5	0.2				
		12		30 70 78 100	148	1.8	0.1				
25	520	13		40 75 75 110	150	1.3	0.1			Gray-redbrown, silty fine SAND, trace fine gravel, very dense, compact, moist. TILL	
		14		70 71 110 110	181	1.5	0.1				Hydrated Bentonite seal, 25.0' - 27.0'
	515	15		100 108 --- ---	---	1.0	0.1				Grade 00N "Ricci" sand, 27.0' - 37.8'
30		16		125 125 --- ---	---	0.9	0.2			Gray, medium to coarse SAND, some fine gravel, trace silt, very dense, wet.	2-inch diameter, Sch 40, 10-slot PVC, screen 27.8' - 37.8'
		17		46 77 83 100	160	1.1	0.2			Green-gray weathered SILTSTONE fragments, wet.	
35	510	18		44 76	176	1.0	0.0				

BLASLAND, BOUCK & LEE ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth
4-10-94	544.38	1.76
7-12-94	540.44	5.73

Project: 342.05

Script: BL-well
Date: 08/11/94

Client:
Bausch & Lomb

Site:
Bausch & Lomb Frame Center Chili, New York

Well No. BL-16D

Total Depth = 37.8 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		18		100 ----	178	1.0	0.0			Grey-green SILTSTONE.	
		19		54 110 ---- ----	----	1.0	0.0				Sump 37.8' - 37.8'
										Bottom of boring at 37.8 ft.	
40	505										
45	500										
50	495										
55	490										

BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Water Levels

Date / Time	Elevation	Depth
4-10-84	544.38	1.78
7-12-84	540.44	5.73

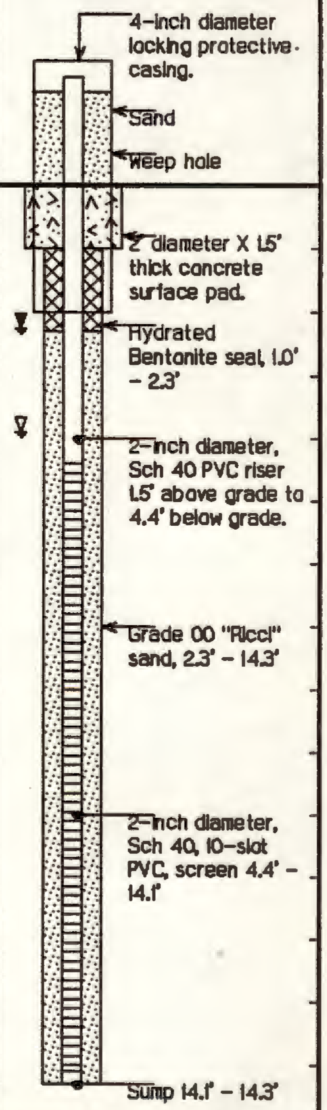
Project: 342.05

Script: BL-well
Date: 08/11/94

Date Start/Finish: 3/25/94 - 3/25/94 **Drilling Company:** Nothnagle Drilling **Driller's Name:** Roger Bower **Drilling Method:** Hollow Stem Auger **Bit Size:** NA-in. **Auger Size** : 4 1/4-in. ID **Rig Type:** CME - 57 **Spoon Size:** 2-in. O.D. **Hammer Weight:** 140-lb **Height of Fall:** 30-in.	**Northing:** **Easting:** **Well Casing Elev.:** 544.53 ft. **Corehole Depth:** NA ft. **Borehole Depth:** 14.0 ft. **Ground Surface Elev.:** 543.0 ft. **Geologist:** David L. Greene	**Well No. BL-18S** **Site:** Bausch & Lomb Frame Center Chili, New York **Client:** Bausch & Lomb

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description
gs elevation 543.0 ft										GROUND SURFACE
		1	/	4 5 7 6	12	1.4	8.0			Brown, fine SAND and SILT, some medium gravel and plant material (roots, grass...), loose, moist.
	540	2	/	6 12 7 12	19	1.0	10.0			Brown-redbrown, fine SAND and SILT, trace fine rounded gravel, medium dense, moist.
5		3	/	11 11 12 14	23	1.9	45.0			
	535	4	/	17 24 33 33	57	1.8	65.0			Brown-gray fine SAND and SILT, some medium gravel, very dense, wet.
10		5	/	22 27 47 44	74	2.0	65.0			Brown-gray fine SAND and SILT, trace fine gravel, very dense, wet.
		6	/	27 27 32 101	59	2.0	100.0			
	530	7	/	22 27 73 77	100	0.5	80.0			
15										Bottom of boring at 14.3 ft.

Well Construction



BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

Remarks:

Soil information obtained from soil boring B-4, which is located adjacent to BL-18S.

Water Levels

Date / Time	Elevation	Depth
4-10-94	542.25	2.25
7-12-94	540.86	3.89

Project: 342.05 Script: BL-well Date: 08/12/94

APPENDIX C

Grain Size Anaylsis Curves

[redacted]parratt[redacted] wolff inc
FISHER RD., EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

Proje[redacted]o.[redacted]-94[redacted]

Project Title Laboratory Testing Bausch & Lomb Frame Center
File # 342.05.34

May 5, 1994

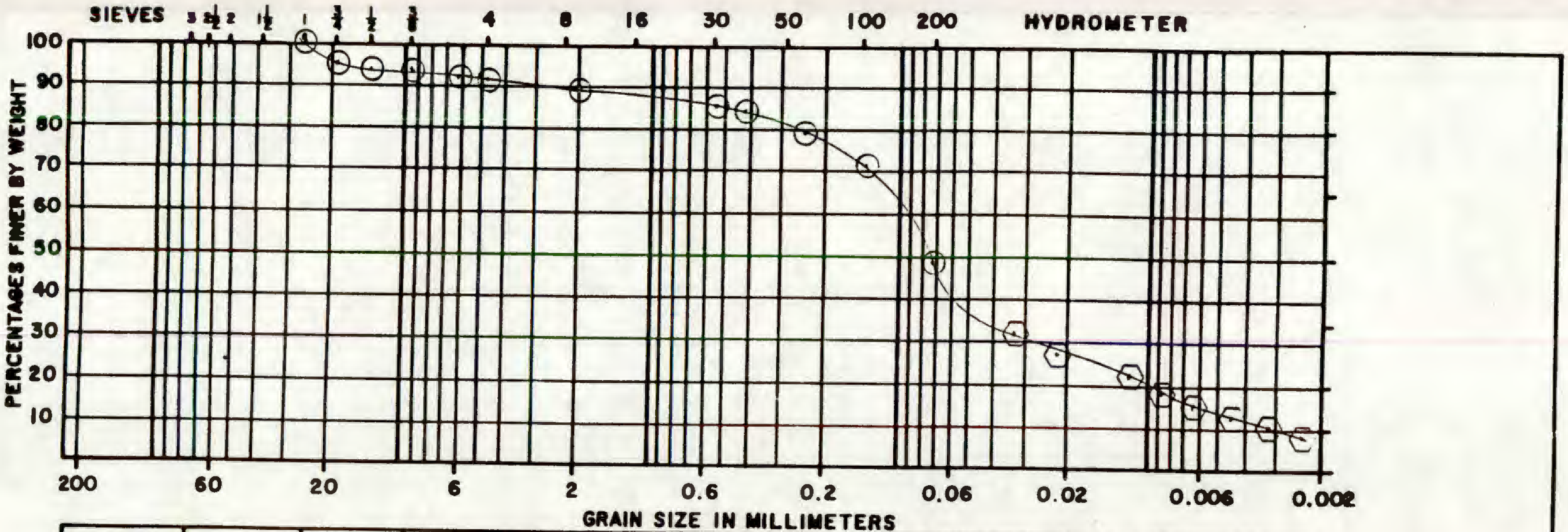
Sieve Analysis ASTM D422

		Sieve Size - Percent Passing Sieve														
Sample	Depth (feet)	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#10	#30	#40	#60	#100	#200		Lab I.D.#
BL-14D	0.0-2.0	–	100	95.2	93.2	93.2	92.0	91.2	89.3	85.6	84.2	79.8	71.0	49.0		4921
BL-14D	2.0-4.0		100	94.5	94.5	94.5	93.7	92.6	90.5	85.9	83.9	78.3	70.1	51.9		4922
BL-14D	4.0-6.0	100	93.0	93.0	87.4	86.8	84.6	83.2	79.2	73.5	71.7	66.8	60.1	44.8		4923
BL-14D	6.0-8.0	–	–	100	97.2	96.0	93.7	91.9	86.9	80.6	78.6	73.1	65.5	49.1		4924
BL-14D	8.0-10.0	–	100	95.9	95.9	90.3	85.4	82.8	77.1	70.7	68.5	62.8	55.3	39.8		4925
BL-14D	10.0-12.0	–	100	95.9	91.0	89.6	86.3	83.9	78.3	71.9	69.8	64.2	56.9	43.0		4926
BL-14D	12.0-14.0	100	95.5	94.1	89.3	85.6	82.5	80.4	74.7	68.4	66.3	60.6	53.2	38.9		4927
BL-14D	14.0-16.0	–	100	97.0	92.3	90.7	88.0	85.5	79.6	72.5	70.1	63.9	56.0	40.7		4928
BL-14D	16.0-18.0	–	–	–	100	99.3	95.9	94.4	90.3	84.9	83.1	78.2	72.2	60.7		4929
BL-14D	18.0-20.0	–	–	–	100	99.0	98.6	97.4	94.7	91.6	90.6	87.8	82.3	63.9		4930
BL-14D	20.0-22.0	–	–	–	100	99.6	98.4	97.9	96.5	95.4	95.1	94.1	92.7	85.7		4931
BL-14D	22.0-24.0	–	–	100	97.0	95.5	93.2	91.4	87.9	83.8	82.7	79.7	75.8	69.4		4932
BL-14D	24.0-26.0	–	–	–	100	99.0	97.7	97.0	94.1	90.4	89.3	86.5	82.7	75.8		4933
BL-14D	26.0-28.0	–	–	100	95.1	94.1	91.6	91.0	88.2	83.2	81.3	75.9	69.7	60.2		4934
BL-14D	28.0-30.0	–	100	96.4	94.9	92.3	87.4	85.7	79.6	73.3	71.5	66.7	60.3	48.7		4935
BL-14D	30.0-32.0	–	–	100	97.8	97.8	97.6	96.8	94.5	89.9	88.2	83.6	77.8	68.4		4936
BL-14D	32.0-34.0	–	100	93.4	93.4	92.8	90.7	89.2	84.3	76.9	74.5	68.3	61.1	48.5		4937

Remarks:

Prewashed ASTM D1140
Yes X No
Performed By FC, CED, VJT

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 · 76.2 · 25.4 · 9.52 · 2.0 · 0.59 · 0.25 · 0.074 MM. OPENING

9 In. · 3 In. · 1 in. · 3/8 in. · Nos. 10 · 30 · 60 · 200 SIEVE

L-94034 — Lab I.D. #: 4921

Laboratory Testing — Sample : BL-14D

Bausch & Lomb Frame Center — Depth : 0.0'-2.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

Hydrometer Analysis ASTM D422

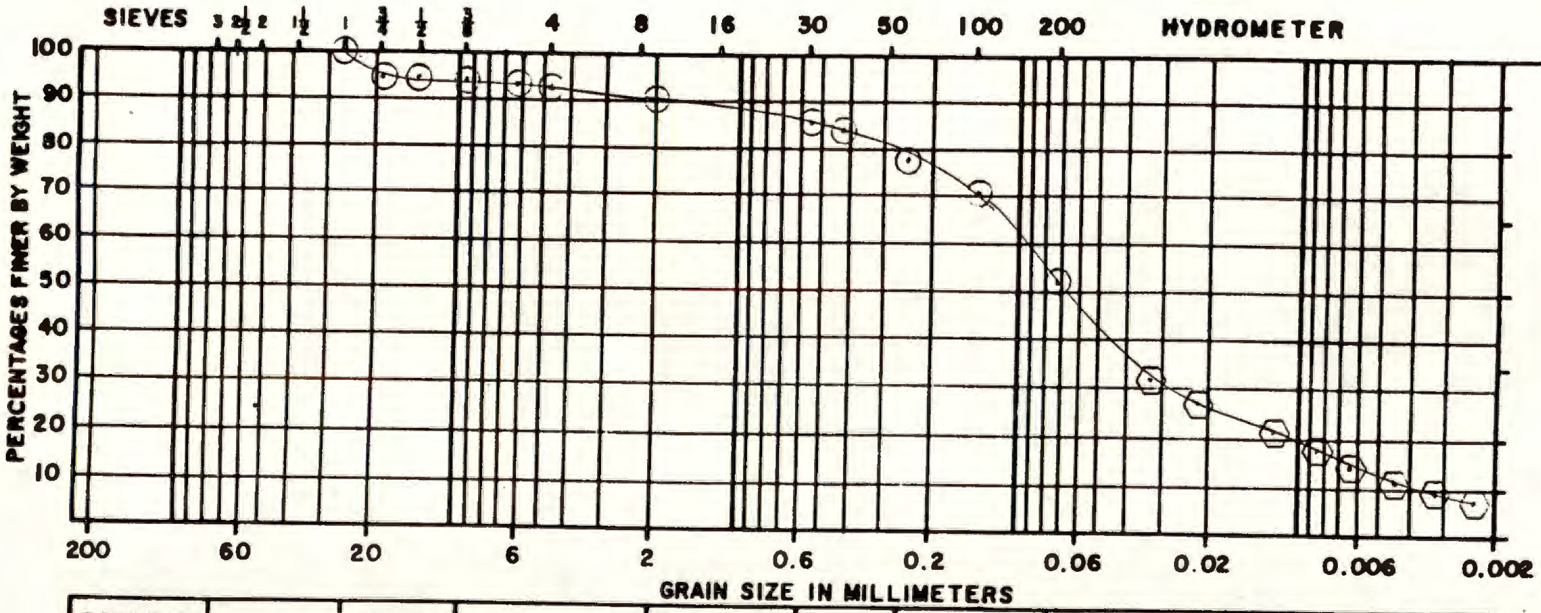
Parratt Wolff Inc
FISHER RD. EAST SYRACUSE N.Y. 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO L-94034

REPORT NO. 1

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 — 76.2 — 25.4 — 9.52 — 2.0 — 0.59 — 0.25 — 0.074 MM. OPENING

9 in. — 3 in. — 1 in. — 3/8 in. — Nos. 10 — 30 — 60 — 200 SIEVE

L-94034 — Lab I.D. #: 4922

Laboratory Testing — Sample : BL-14D

Bausch & Lomb Frame Center — Depth : 2.0'-4.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

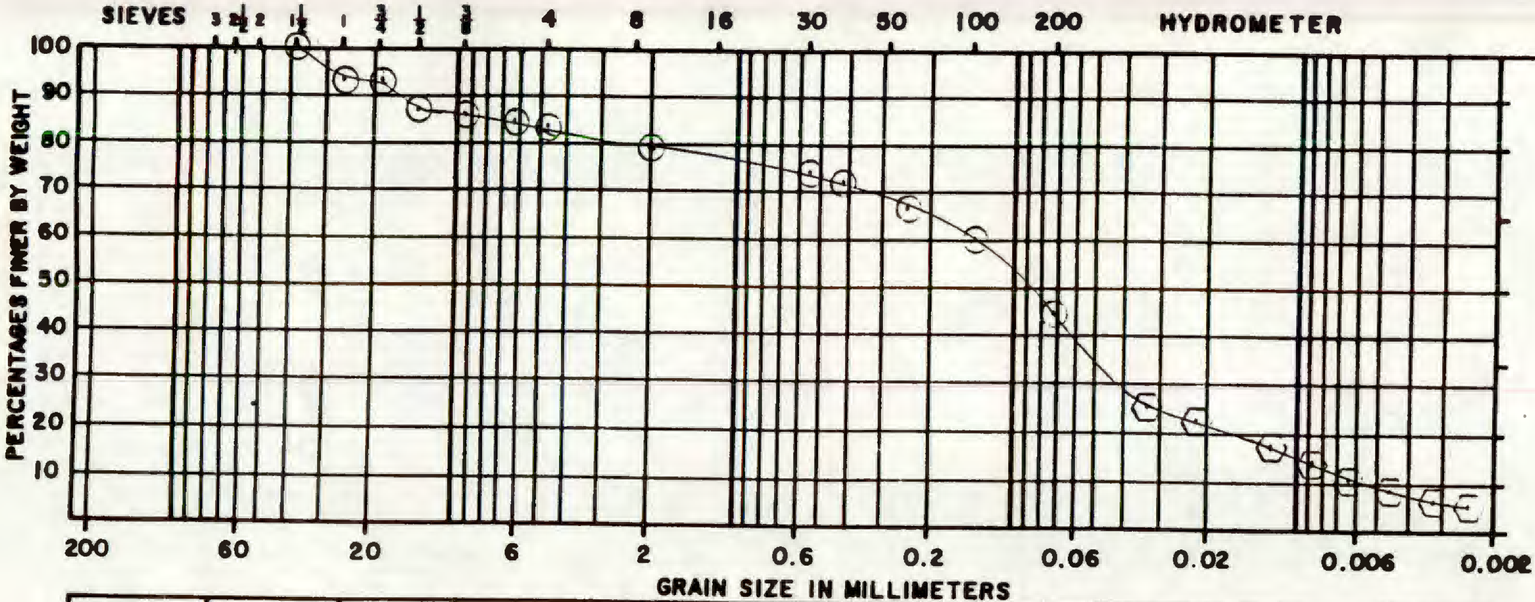
⬡ Hydrometer Analysis ASTM D422

Parratt Wolff Inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO L-94034
REPORT NO. 2

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228	76.2	25.4	9.52	2.0	0.59	0.25	0.074 MM.	OPENING
9 in.	3 in.	1 in.	3/8 in.	Nos. 10	30	60	200	SIEVE

L-94034 — Lab I.D. #: 4923

Laboratory Testing — Sample : BL-14D

Bausch & Lomb Frame Center — Depth : 4.0'-6.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

⬡ Hydrometer Analysis ASTM D422

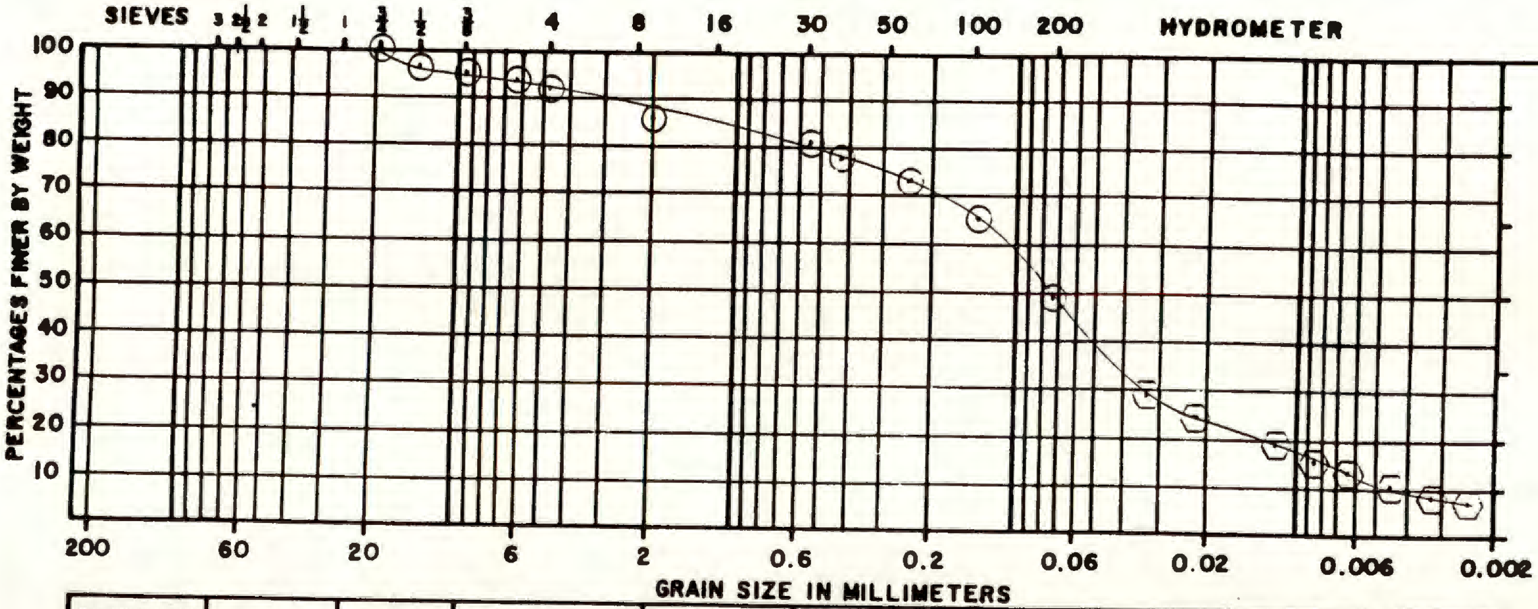
parratt wolff inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO. L-94034

REPORT NO. 3

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 76.2 25.4 9.52 2.0 0.59 0.25 0.074 MM. OPENING

9 In. 3 In. 1 in. 3/8 in. Nos. 10 30 60 200 SIEVE

L-94034 Lab I.D. #: 4924

Laboratory Testing Sample : BL-14D

Bausch & Lomb Frame Center Depth : 6.0'-8.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

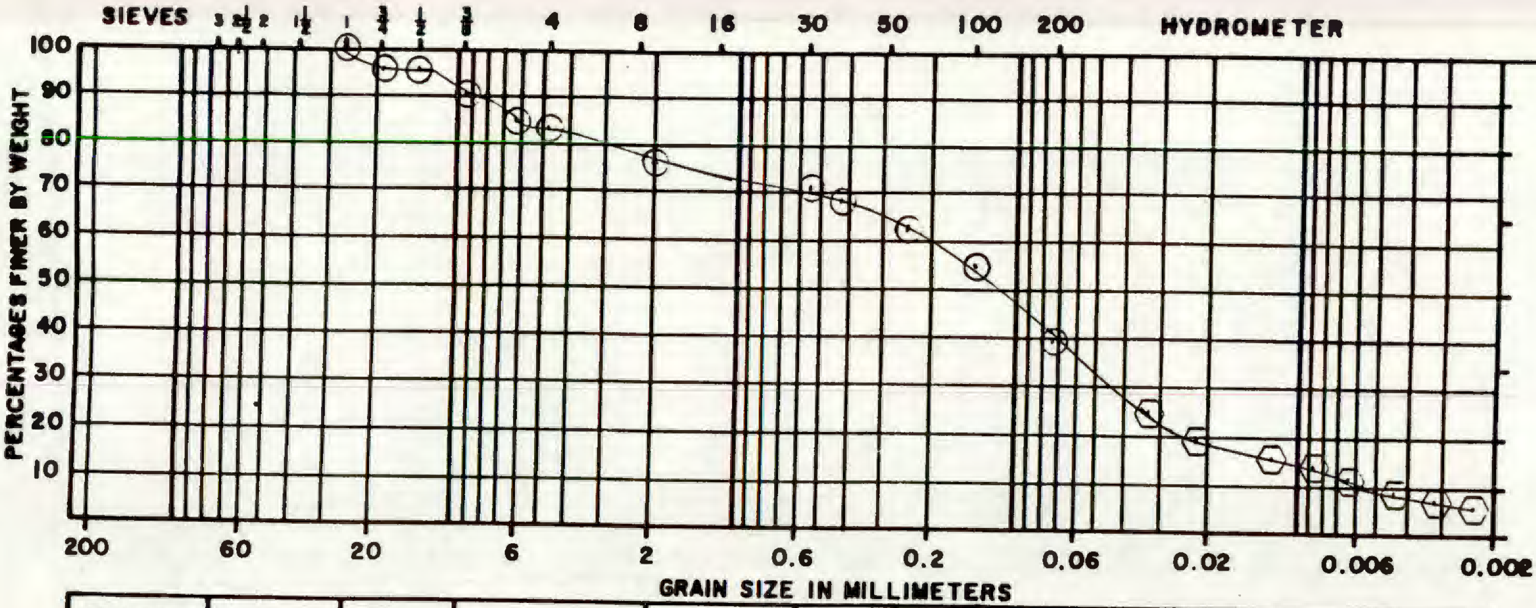
⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE N.Y. 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO L-94034
REPORT NO. 4

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 76.2 25.4 9.52 2.0 0.59 0.25 0.074 MM. OPENING

9 in. 3 in. 1 in. 3/8 in. Nos. 10 30 60 200 SIEVE

L-94034 Lab I.D. #: 4925

Laboratory Testing Sample : BL-14D

Bausch & Lomb Frame Center Depth : 8.0'-10.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

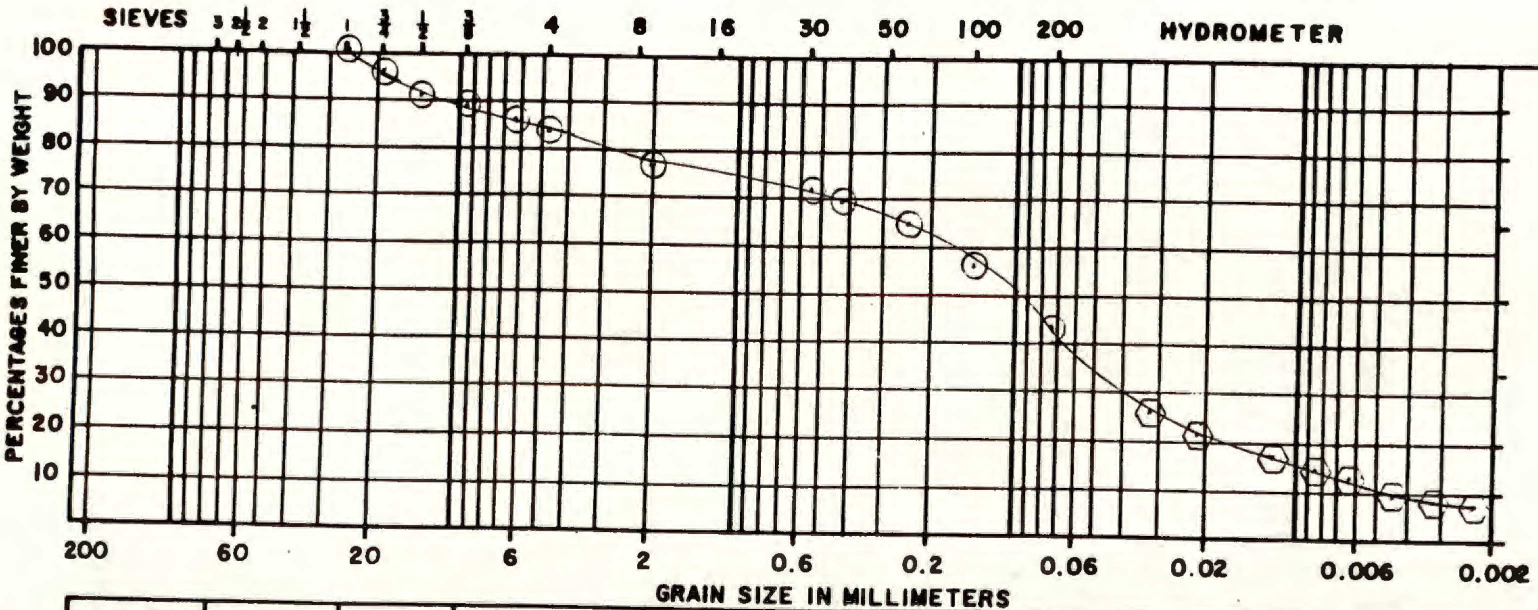
⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE N.Y. 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO. L-94034
REPORT NO. 5

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 76.2 25.4 9.52 2.0 0.59 0.25 0.074 MM. OPENING

9 In. 3 In. 1 in. 3/8 in. Nos. 10 30 60 200 SIEVE

L-94034 Lab I.D. #: 4926

Laboratory Testing Sample : BL-14D

Bausch & Lomb Frame Center Depth : 10.0'-12.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

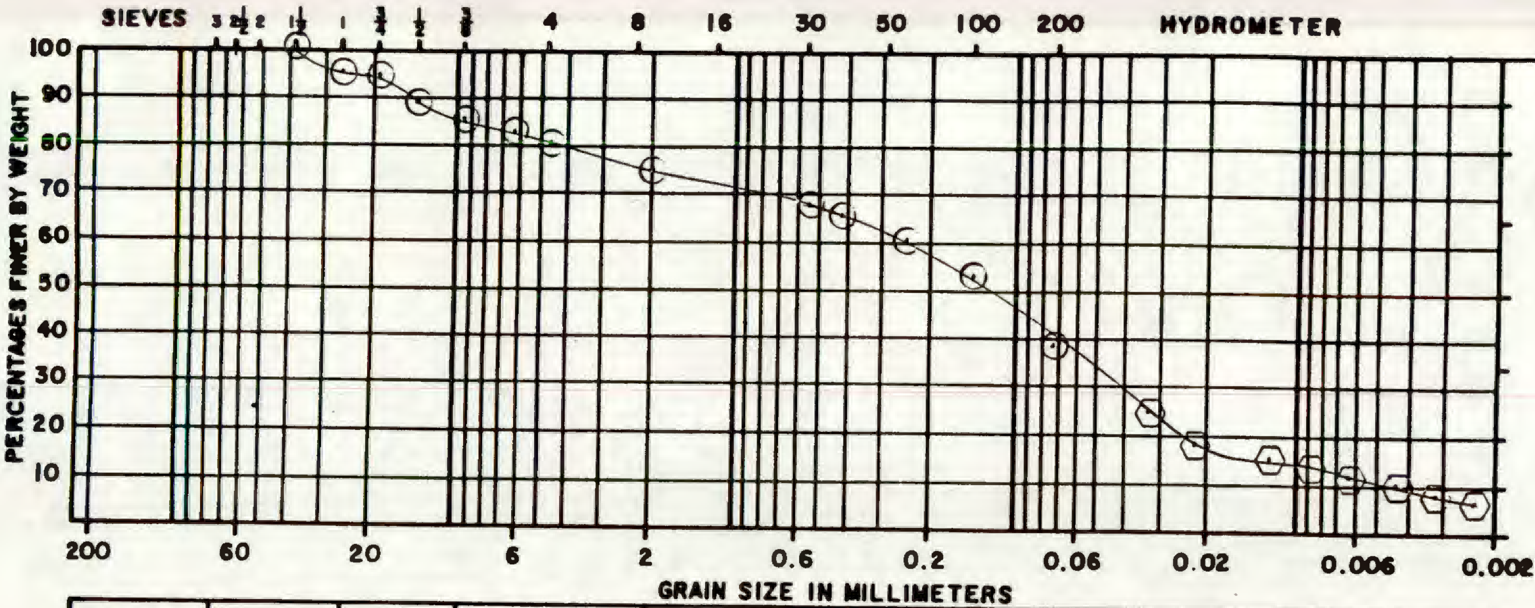
⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO L-94034
REPORT NO. 6

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228	76.2	25.4	9.52	2.0	0.59	0.25	0.074 MM.	OPENING
9 In.	3 in.	1 in.	3/8 in.	Nos. 10	30	60	200	SIEVE

L-94034

Lab I.D. #: 4927

Laboratory Testing

Sample : BL-14D

Bausch & Lomb Frame Center

Depth : 12.0'-14.0'

File # 342.05.34

Ⓒ Sieve Analysis ASTM D422 and D1140

⬡ Hydrometer Analysis ASTM D422

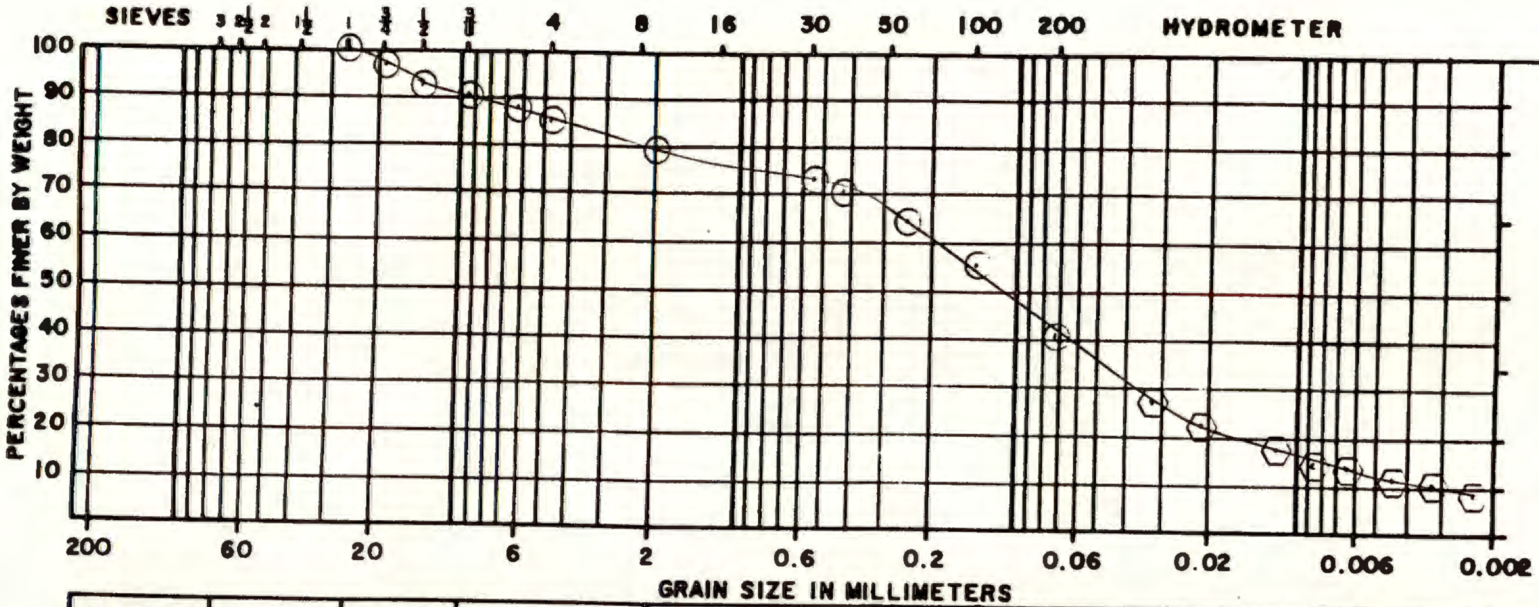
parratt wolff inc
FISHER RD. EAST SYRACUSE N.Y. 13057
TELEPHONE AREA CODE 315-437-1429

JOB NO. L-94034

REPORT NO. 7

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 — 76.2 — 25.4 — 9.52 — 2.0 — 0.59 — 0.25 — 0.074 MM. OPENING

9 In. — 3 In. — 1 in. — 3/8 in. — Nos. 10 — 30 — 60 — 200 SIEVE

L-94034 | Lab I.D. #: 4928

Laboratory Testing | Sample : BL-14D

Bausch & Lomb Frame Center | Depth : 14.0'-16.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

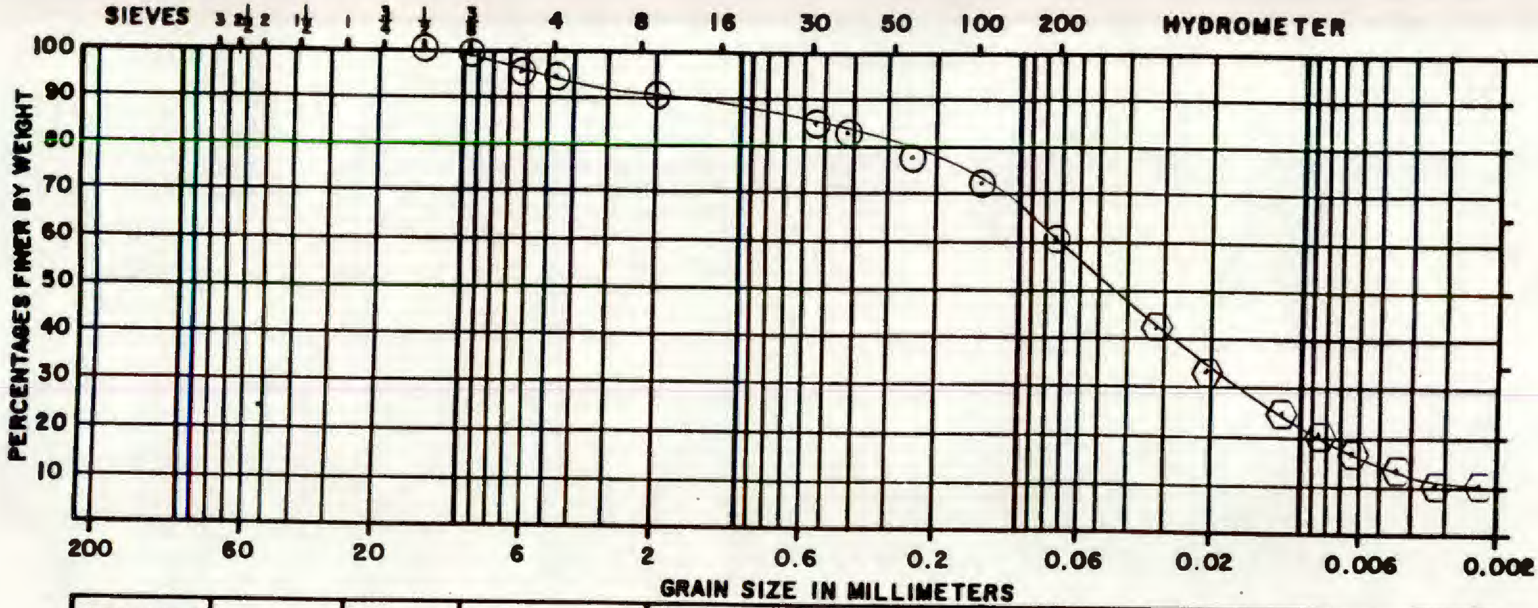
⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO L-94034
REPORT NO. 8

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228	76.2	25.4	9.52	2.0	0.59	0.25	0.074 MM.	OPENING
9 In.	3 In.	1 In.	3/8 in.	Nos. 10	30	60	200	SIEVE

L-94034 — Lab I.D. #: 4929

Laboratory Testing — Sample : BL-14D

Bausch & Lomb Frame Center — Depth : 16.0'-18.0'

File # 342.05.34

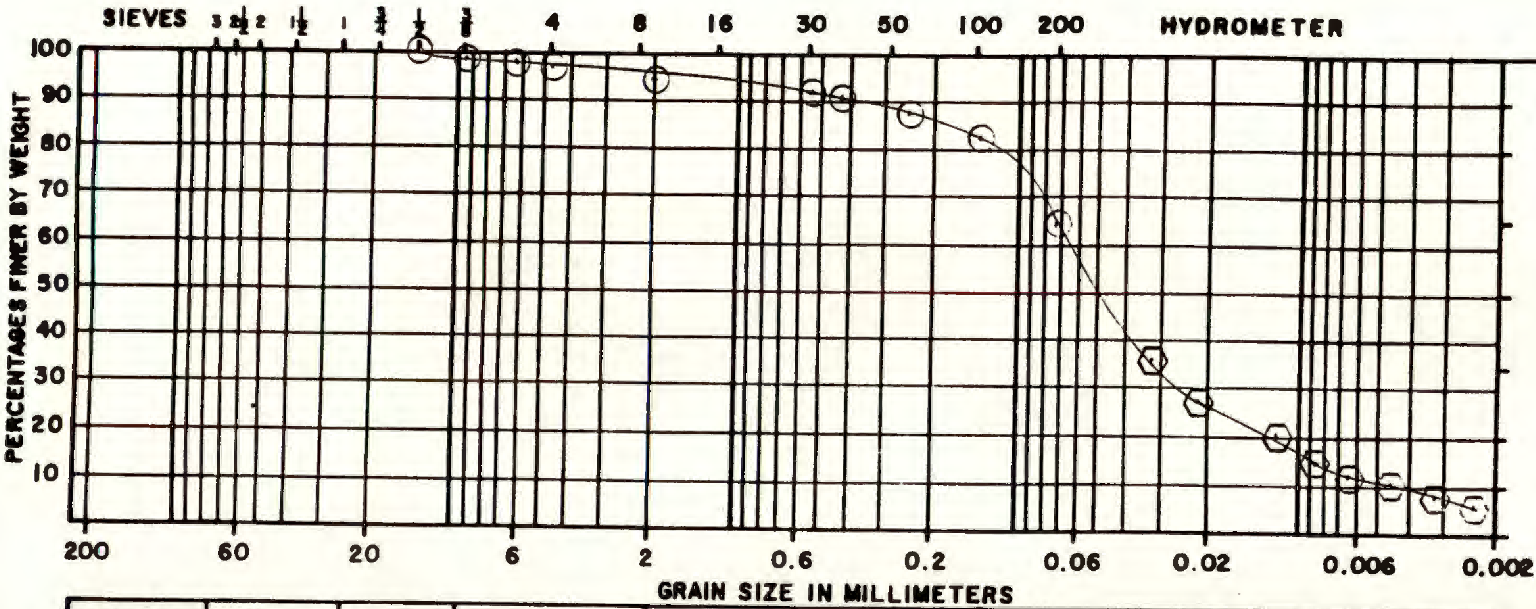
⊙ Sieve Analysis ASTM D422 and D1140

⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO L-94034
REPORT NO. 9
May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 76.2 25.4 9.52 2.0 0.59 0.25 0.074 MM. OPENING

9 In. 3 in. 1 in. 3/8 in. Nos. 10 30 60 200 SIEVE

L-94034 Lab I.D. #: 4930

Laboratory Testing Sample : BL-14D

Bausch & Lomb Frame Center Depth : 18.0'-20.0'

File # 342.05.34

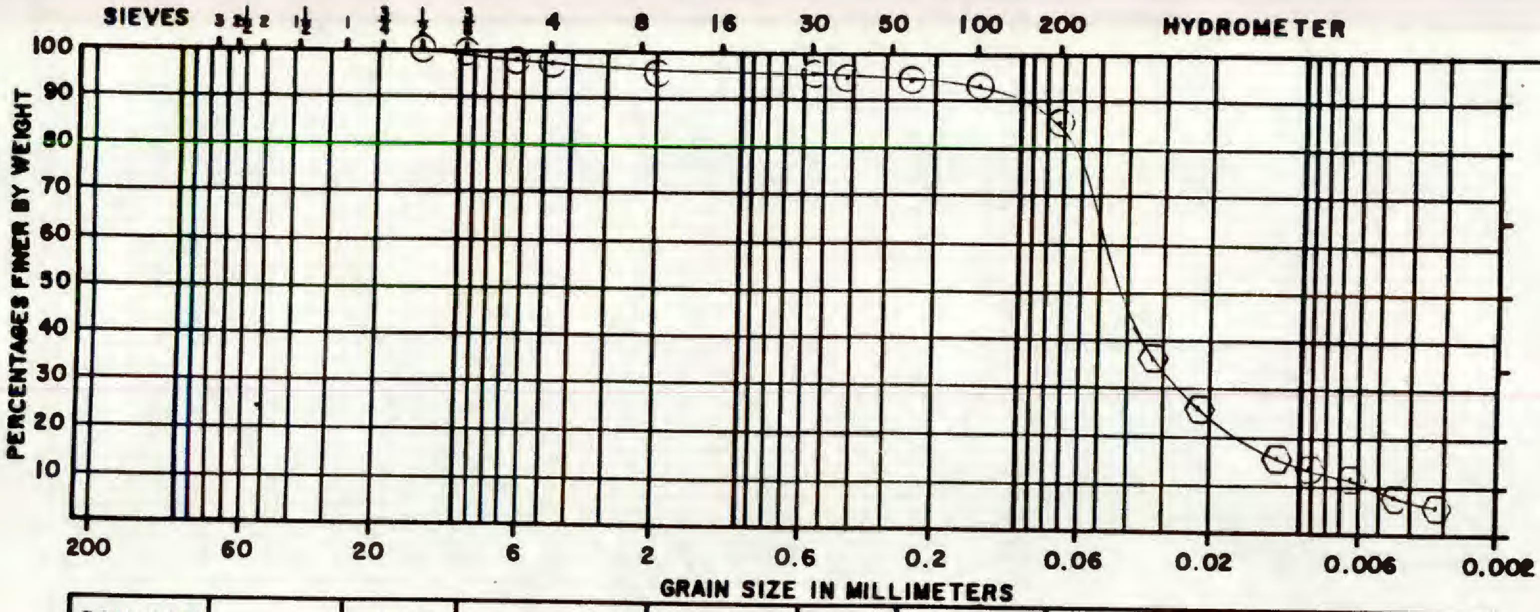
⊙ Sieve Analysis ASTM D422 and D1140

⬡ Hydrometer Analysis ASTM D422

Parratt Wolff Inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO L-94034
REPORT NO. 10
May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 76.2 25.4 9.52 2.0 0.59 0.25 0.074 MM. OPENING

9 in. 3 in. 1 in. 3/8 in. Nos. 10 30 60 200 SIEVE

L-94034 Lab I.D. #: 4931

Laboratory Testing Sample : BL-14D

Bausch & Lomb Frame Center Depth : 20.0'-22.0'

File # 342.05.34

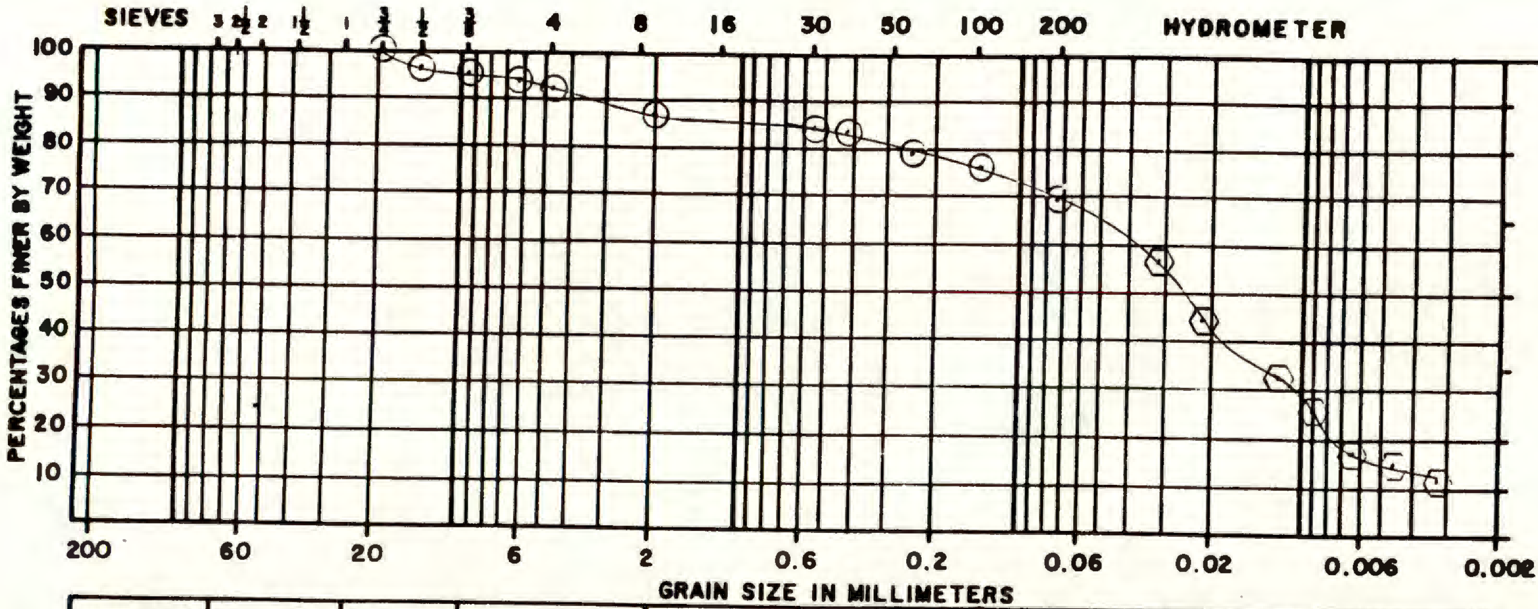
⊙ Sieve Analysis ASTM D422 and D1140

⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO L-94034
REPORT NO. 11
May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 | 76.2 | 25.4 | 9.52 | 2.0 | 0.59 | 0.25 | 0.074 MM. OPENING

9 In. | 3 In. | 1 In. | 3/8 In. | Nos. 10 | 30 | 60 | 200 SIEVE

L-94034 — Lab I.D. #: 4932

Laboratory Testing — Sample : BL-14D

Bausch & Lomb Frame Center — Depth : 22.0'-24.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

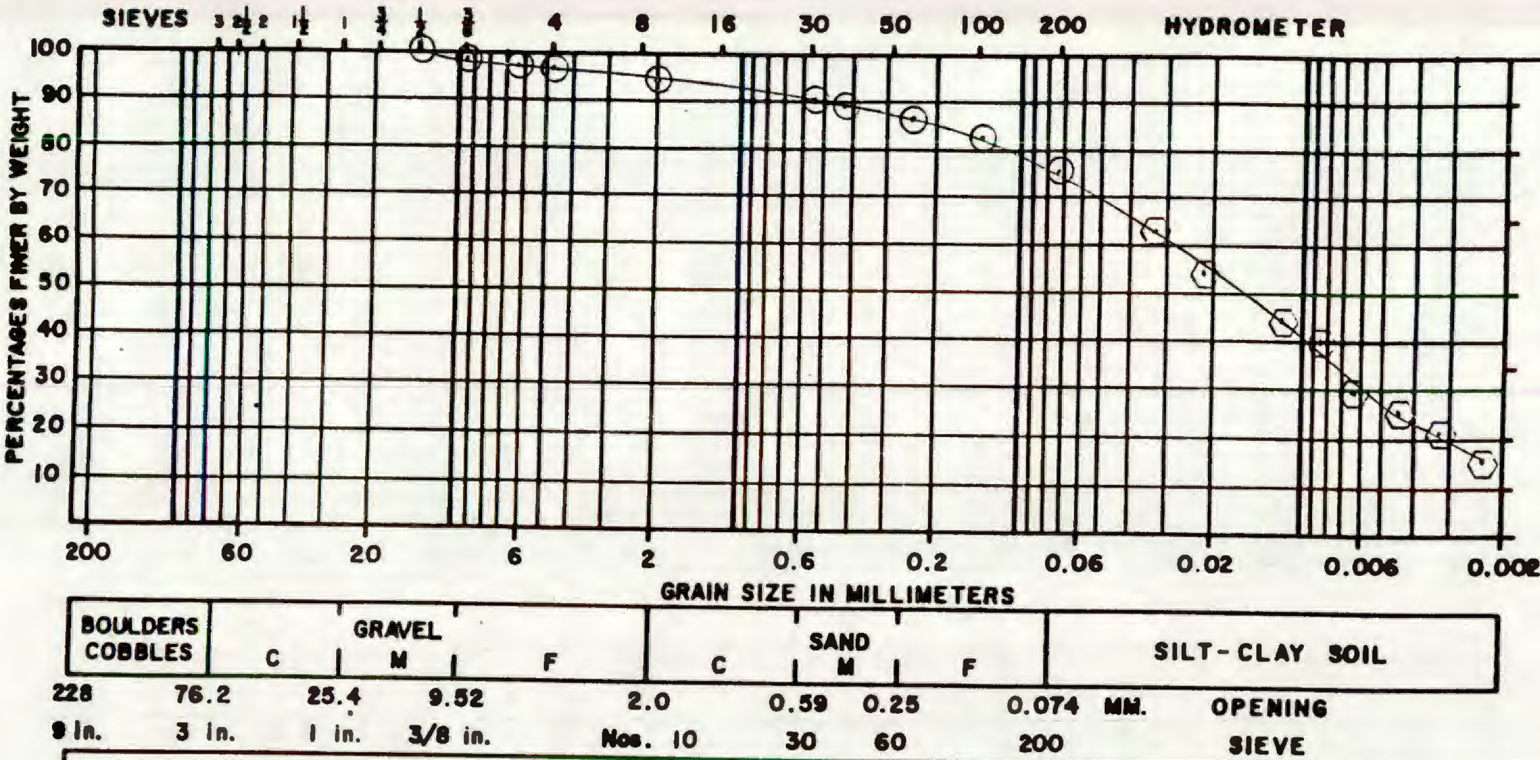
⬡ Hydrometer Analysis ASTM D422

Parratt Wolff Inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO. L-94034
REPORT NO. 12

May 5, 1994

GRAIN SIZE ANALYSIS



L-94034

Laboratory Testing

Bausch & Lomb Frame Center

File # 342.05.34

Lab I.D. #: 4933

Sample : BL-14D

Depth : 24.0'-26.0'

⊙ Sieve Analysis ASTM D422 and D1140

⬡ Hydrometer Analysis ASTM D422

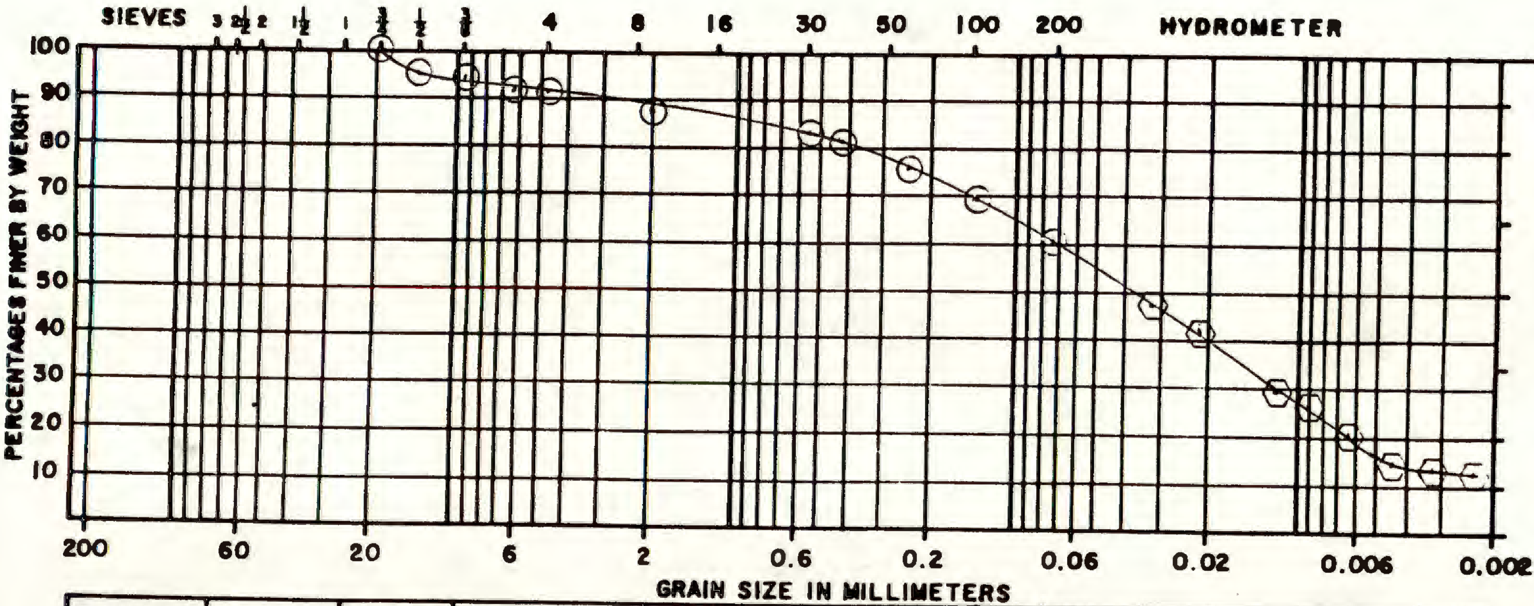
parratt wolff inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315-437-1429

JOB NO. L-94034

REPORT NO. 13

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 76.2 25.4 9.52 2.0 0.59 0.25 0.074 MM. OPENING

9 in. 3 in. 1 in. 3/8 in. Nos. 10 30 60 200 SIEVE

L-94034 Lab I.D. #: 4934

Laboratory Testing Sample : BL-14D

Bausch & Lomb Frame Center Depth : 26.0'-28.0'

File # 342.05.34

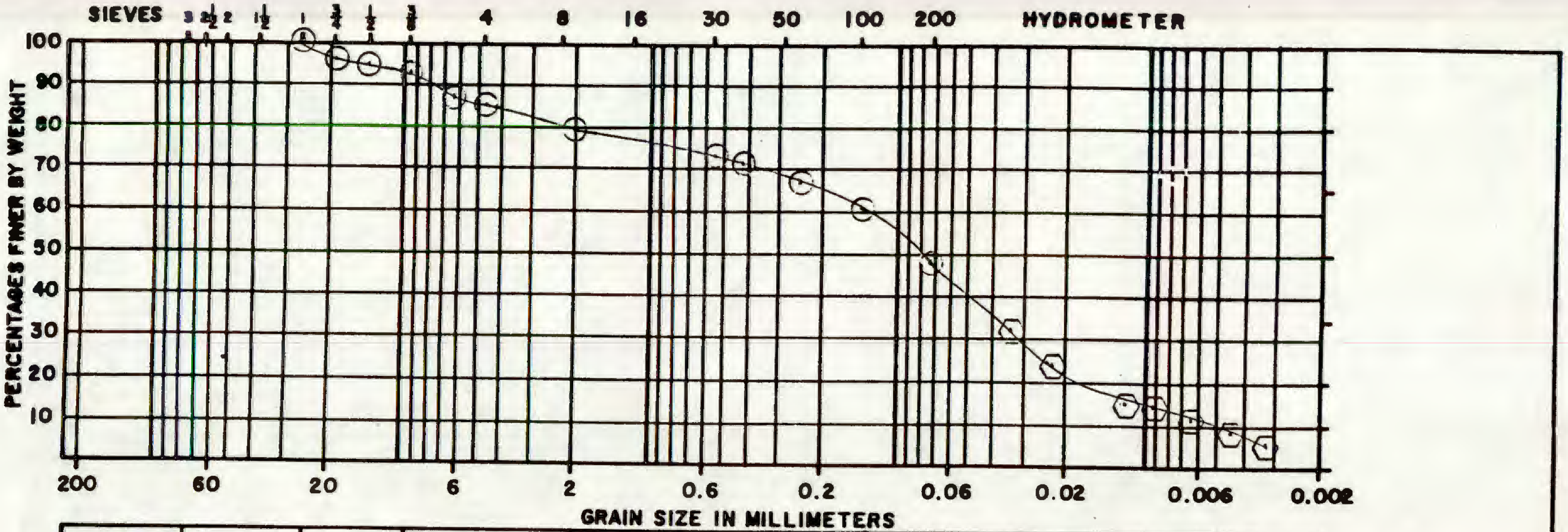
⊙ Sieve Analysis ASTM D422 and D1140

⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE N.Y. 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO. L-94034
REPORT NO. 14
May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228	76.2	25.4	9.52	2.0	0.59	0.25	0.074 MM.	OPENING
9 in.	3 in.	1 in.	3/8 in.	Nos. 10	30	60	200	SIEVE

L-94034 — Lab I.D. #: 4935

Laboratory Testing — Sample : BL-14D

Bausch & Lomb Frame Center — Depth : 28.0'-30.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

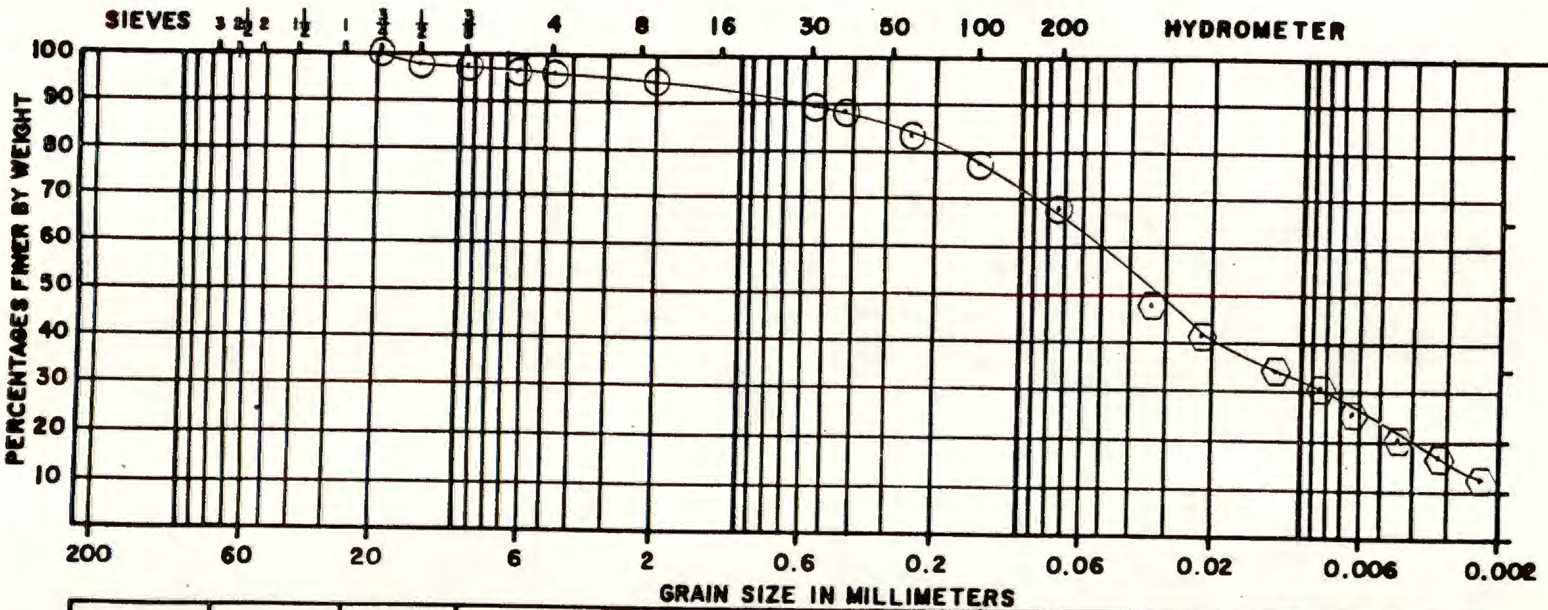
⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315/437 1429

JOB NO L-94034
REPORT NO. 15

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 | 76.2 | 25.4 | 9.52 | 2.0 | 0.59 | 0.25 | 0.074 MM. OPENING

9 in. | 3 in. | 1 in. | 3/8 in. | Nos. 10 | 30 | 60 | 200 SIEVE

L-94034 — Lab I.D. #: 4936

Laboratory Testing — Sample : BL-14D

Bausch & Lomb Frame Center — Depth : 30.0'-32.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

⬡ Hydrometer Analysis ASTM D422

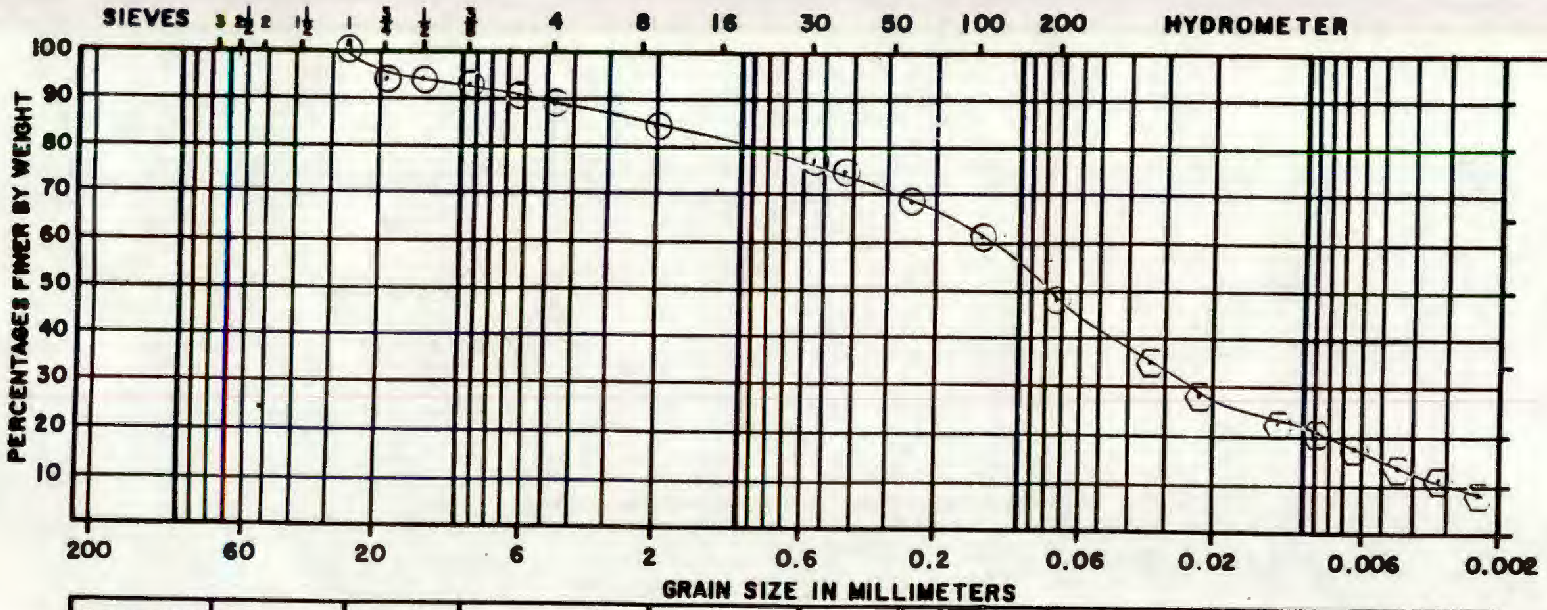
parratt wolff inc
FISHER RD. EAST SYRACUSE N.Y. 13057
TELEPHONE AREA CODE 315 437 1429

JOB NO. L-94034

REPORT NO. 16

May 5, 1994

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228	76.2	25.4	9.52	2.0	0.59	0.25	0.074	MM.	OPENING
9 In.	3 In.	1 In.	3/8 in.	Nos. 10	30	60	200		SIEVE

L-94034 — Lab I.D. #: 4937

Laboratory Testing — Sample : BL-14D

Bausch & Lomb Frame Center — Depth : 32.0'-34.0'

File # 342.05.34

⊙ Sieve Analysis ASTM D422 and D1140

⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE N Y 13057
TELEPHONE AREA CODE 315/437 1429

JOB NO. L-94034

REPORT NO. 17

May 5, 1994

APPENDIX D

In-situ Hydraulic Conductivity Test Results

Project: BAUSCH & LOMB, DEV. TEST 1
Project No.: 342.05
Well No.: BL-8r
Test Date: MARCH 29, 1994
Formation Tested: OVERBURDEN/ TOP ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	0.0	0.00
Static water depth from stickup (ft)	0.32	9.75
Depth to bottom of screen from ground level (ft)	24.1	734.57
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	30	914.40
Delta H at Time 0 (ft)	1.60	48.77
Delta H at Time t (ft)	0.83	25.30
Time t (seconds)	363	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	1.1	5.3E-05
K, (Hvorslev Time Lag)	2.4	1.1E-04
K, (Hvorslev Variable Head)	2.4	1.1E-04

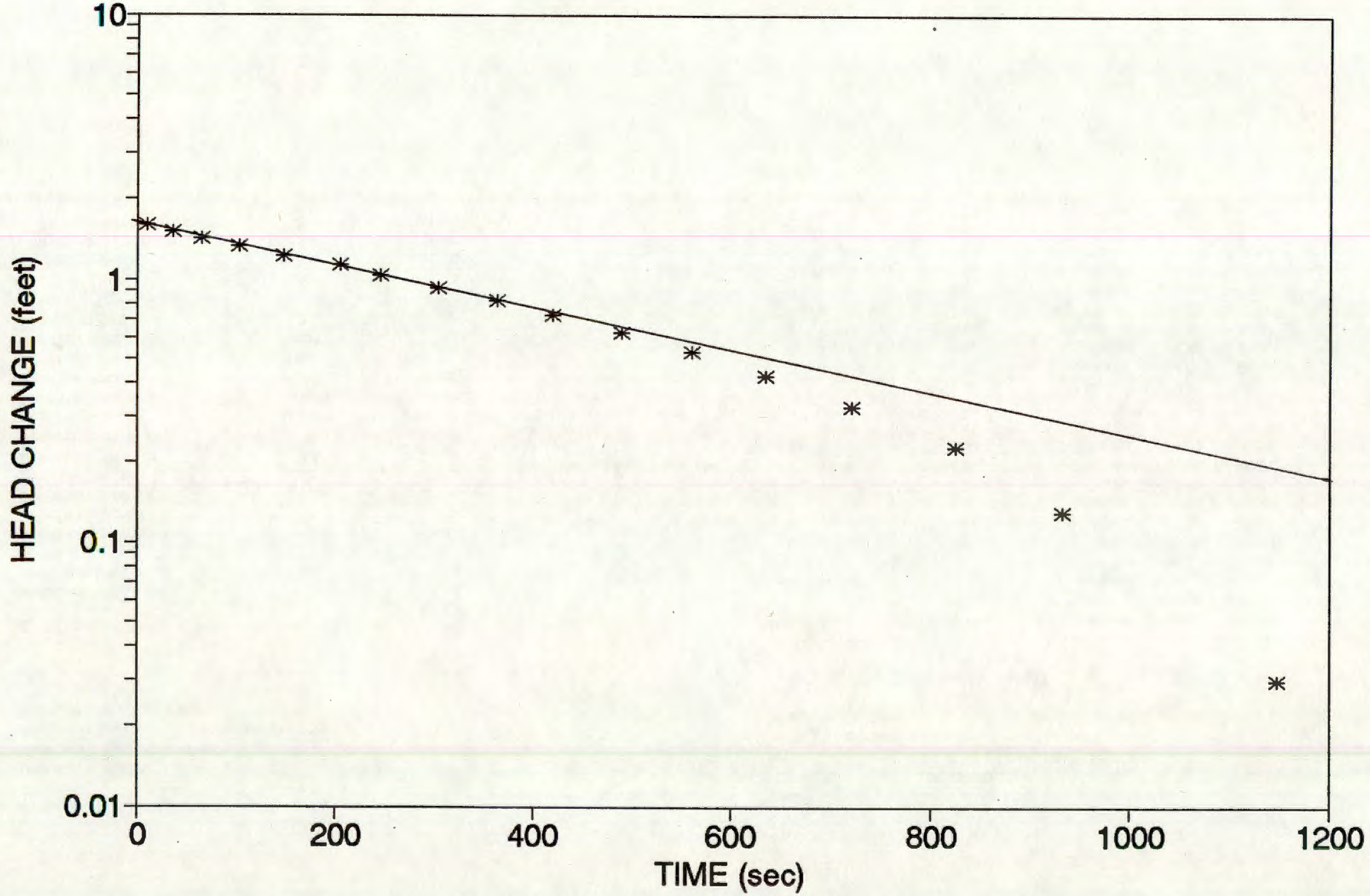
SLUG TEST DATA REDUCTION

Well: BL-8r
Date: MARCH 29, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 0.32
Initial Time (seconds): 0.00

Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	0.32		0.00	0.00	0.00
0	0	10	1.92		10.00	1.60	48.61
0	0	36	1.85		36.00	1.53	46.48
0	1	4	1.75		64.00	1.43	43.44
0	1	42	1.65		102.00	1.33	40.41
0	2	27	1.55		147.00	1.23	37.37
0	3	25	1.45		205.00	1.13	34.33
0	4	5	1.35		245.00	1.03	31.29
0	5	4	1.25		304.00	0.93	28.25
0	6	3	1.15		363.00	0.83	25.22
0	7	0	1.05		420.00	0.73	22.18
0	8	10	0.95		490.00	0.63	19.14
0	9	20	0.85		560.00	0.53	16.10
0	10	34	0.75		634.00	0.43	13.06
0	12	0	0.65		720.00	0.33	10.03
0	13	45	0.55		825.00	0.23	6.99
0	15	32	0.45		932.00	0.13	3.95
0	19	8	0.35		1148.00	0.03	0.91

BAUSCH & LOMB FRAME CENTER
BL-8r RISING HEAD,DEV.TEST 1



SLUG TEST DATA REDUCTION

Well: BL-13S
Date: MARCH 28, 1994
Project: BAUSCH & LOMB DEV. TEST 1
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 5.11
Initial Time (seconds): 0.00

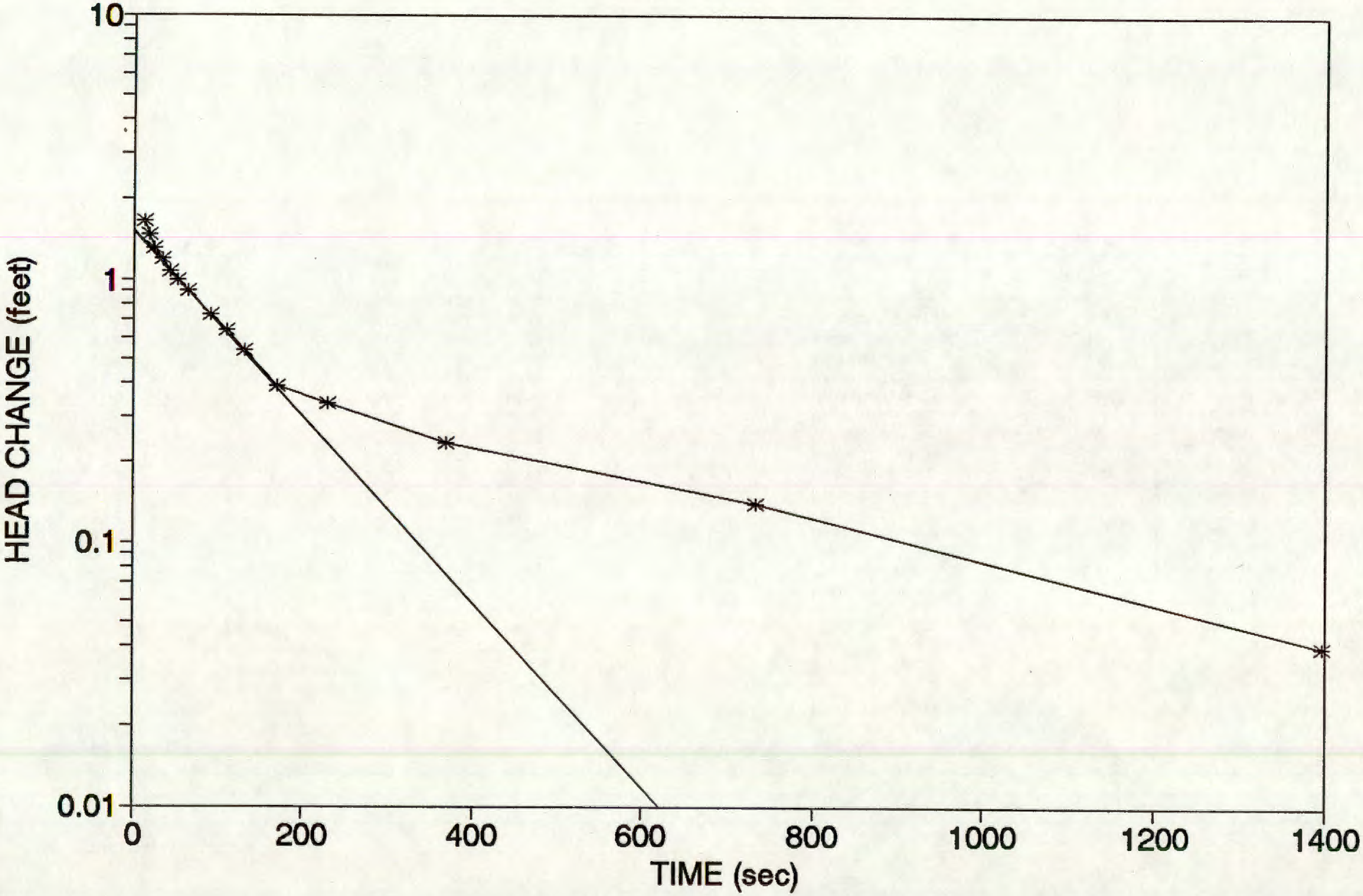
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	5.11		0.00	0.00	0.00
0	0	14	6.78		14.00	1.67	50.73
0	0	18	6.60		18.00	1.49	45.27
0	0	23	6.43		23.00	1.32	40.10
0	0	34	6.30		34.00	1.19	36.15
0	0	44	6.19		44.00	1.08	32.81
0	0	52	6.10		52.00	0.99	30.08
0	1	5	6.01		65.00	0.90	27.34
0	1	30	5.84		90.00	0.73	22.18
0	1	50	5.75		110.00	0.64	19.44
0	2	12	5.65		132.00	0.54	16.41
0	2	50	5.50		170.00	0.39	11.85
0	3	50	5.45		230.00	0.34	10.33
0	6	9	5.35		369.00	0.24	7.29
0	12	15	5.25		735.00	0.14	4.25
0	23	18	5.15		1398.00	0.04	1.22

Project: BAUSCH & LOMB, DEV. TEST 1
Project No.: 342.05
Well No.: BL-13S
Test Date: MARCH 28, 1994
Formation Tested: OVERBURDEN
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.7	82.30
Static water depth from stickup (ft)	5.11	155.75
Depth to bottom of screen from ground level (ft)	15.1	460.25
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	30	914.40
Delta H at Time 0 (ft)	1.60	48.77
Delta H at Time t (ft)	0.39	11.89
Time t (seconds)	170	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	4.5	2.1E-04
K, (Hvorslev Time Lag)	10.9	5.1E-04
K, (Hvorslev Variable Head)	10.8	5.1E-04

BAUSCH & LOMB
BL-13S RISING HEAD, DEV. TEST 1



SLUG TEST DATA REDUCTION

Well: BL-13D
Date: MARCH 28, 1994
Project: BAUSCH & LOMB DEV. TEST 1
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 4.85
Initial Time (seconds): 0.00

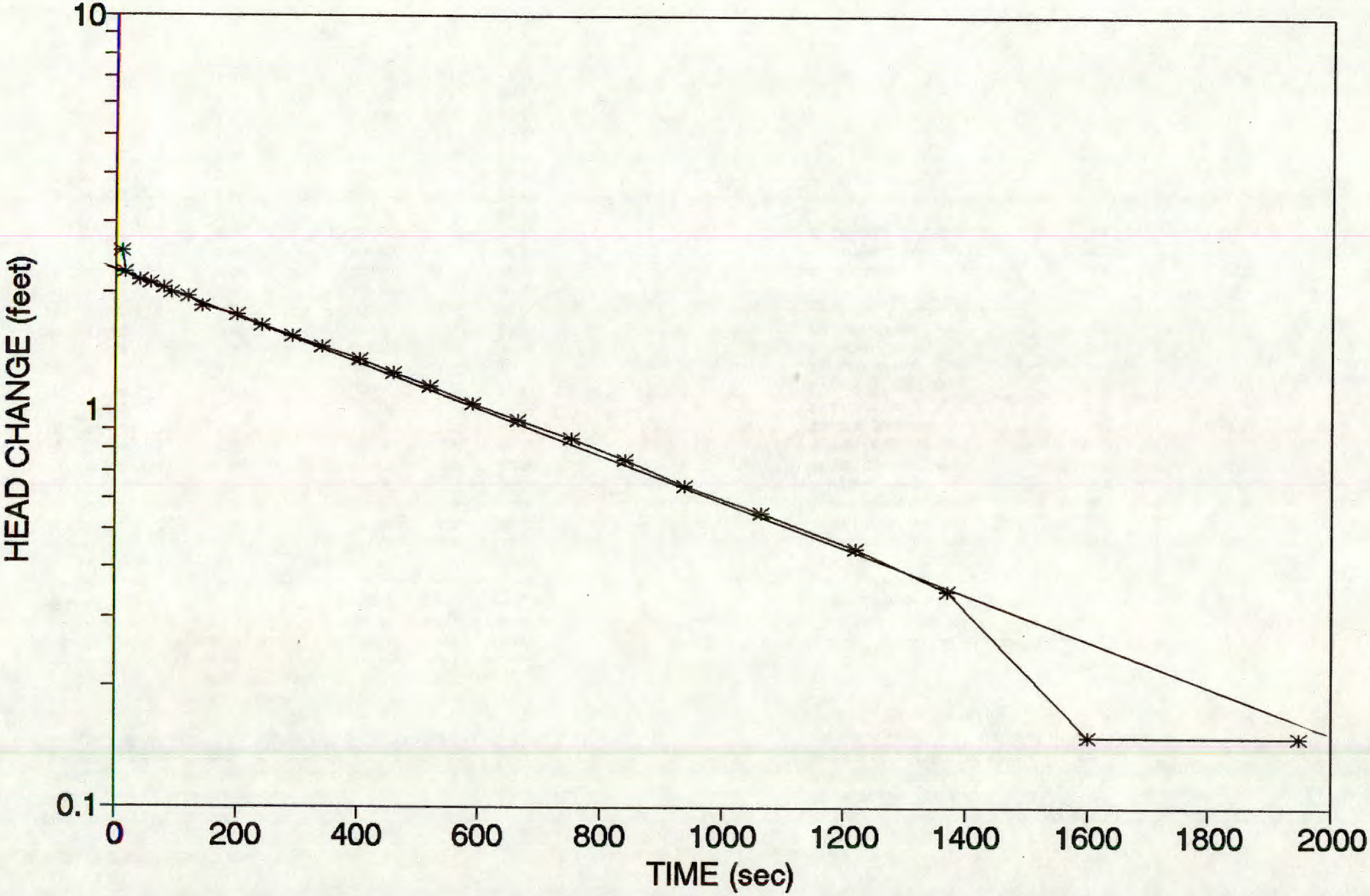
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	4.85		0.00	0.00	0.00
0	0	11	7.39		11.00	2.54	77.17
0	0	15	7.10		15.00	2.25	68.36
0	0	40	7.00		40.00	2.15	65.32
0	0	58	6.95		58.00	2.10	63.80
0	1	20	6.90		80.00	2.05	62.28
0	1	33	6.84		93.00	1.99	60.46
0	2	0	6.79		120.00	1.94	58.94
0	2	25	6.70		145.00	1.85	56.20
0	3	20	6.60		200.00	1.75	53.17
0	4	2	6.50		242.00	1.65	50.13
0	4	53	6.40		293.00	1.55	47.09
0	5	40	6.30		340.00	1.45	44.05
0	6	42	6.20		402.00	1.35	41.01
0	7	40	6.10		460.00	1.25	37.98
0	8	40	6.00		520.00	1.15	34.94
0	9	50	5.90		590.00	1.05	31.90
0	11	6	5.80		666.00	0.95	28.86
0	12	32	5.70		752.00	0.85	25.82
0	14	0	5.60		840.00	0.75	22.79
0	15	40	5.50		940.00	0.65	19.75
0	17	45	5.40		1065.00	0.55	16.71
0	20	20	5.30		1220.00	0.45	13.67
0	22	50	5.20		1370.00	0.35	10.63
0	26	40	5.00		1600.00	0.15	4.56
0	32	30	5.00		1950.00	0.15	4.56

Project: BAUSCH & LOMB, DEV. TEST 1
Project No.: 342.05
Well No.: BL-13D
Test Date: MARCH 28, 1994
Formation Tested: OVERBURDEN/TOP ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.8	85.34
Static water depth from stickup (ft)	4.85	147.83
Depth to bottom of screen from ground level (ft)	35.0	1066.80
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	2.25	68.58
Delta H at Time t (ft)	1.75	53.34
Time t (seconds)	200	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	0.8	3.9E-05
K, (Hvorslev Time Lag)	1.6	7.8E-05
K, (Hvorslev Variable Head)	1.6	7.7E-05

BAUSCH & LOMB
BL-13D RISING HEAD, DEV. TEST 1



SLUG TEST DATA REDUCTION

Well: BL-14S
Date: MARCH 28, 1994
Project: BAUSCH & LOMB DEV. TEST 1
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 2.04
Initial Time (seconds): 0.00

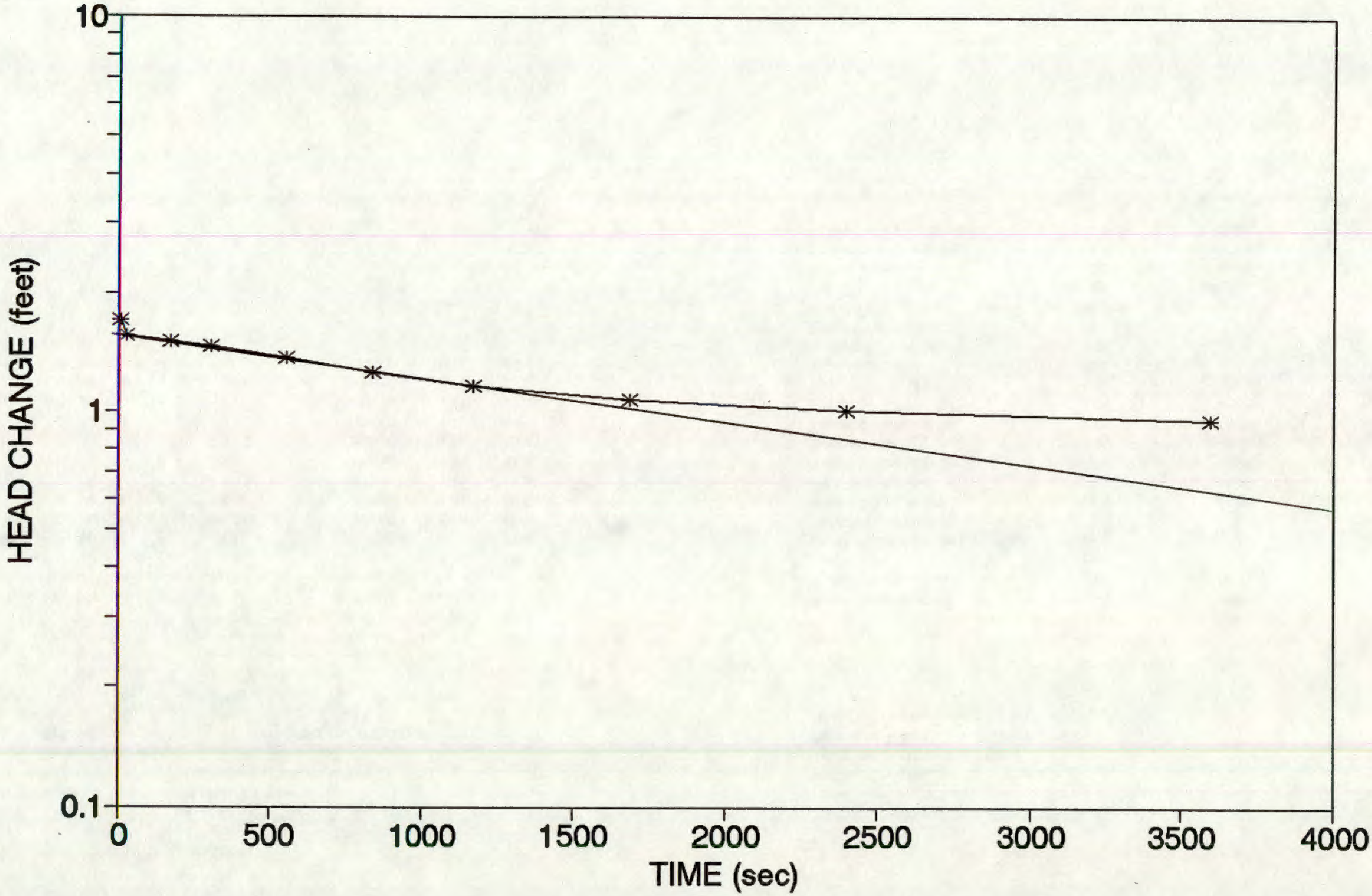
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	2.04		0.00	0.00	0.00
0	0	8	3.75		8.00	1.71	51.95
0	0	25	3.60		25.00	1.56	47.39
0	2	56	3.55		176.00	1.51	45.87
0	5	10	3.50		310.00	1.46	44.35
0	9	15	3.40		555.00	1.36	41.32
0	14	0	3.30		840.00	1.26	38.28
0	19	36	3.20		1176.00	1.16	35.24
0	28	9	3.11		1689.00	1.07	32.51
0	40	0	3.05		2400.00	1.01	30.68
0	60	0	3.00		3600.00	0.96	29.16

Project: BAUSCH & LOMB, DEV. TEST 1
Project No.: 342.05
Well No.: BL-14S
Test Date: MARCH 28, 1994
Formation Tested: OVERBURDEN
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.5	76.20
Static water depth from stickup (ft)	2.04	62.18
Depth to bottom of screen from ground level (ft)	24.0	731.52
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	8.00	243.84
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	1.56	47.55
Delta H at Time t (ft)	1.36	41.45
Time t (seconds)	555	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	0.2	8.1E-06
K, (Hvorslev Time Lag)	0.4	1.8E-05
K, (Hvorslev Variable Head)	0.4	1.8E-05

BAUSCH & LOMB
BL-14S RISING HEAD, DEV. TEST 1



SLUG TEST DATA REDUCTION

Well: BL-14D
Date: MARCH 28, 1994
Project: BAUSCH & LOMB DEV. TEST 1
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 4.73
Initial Time (seconds): 0.00

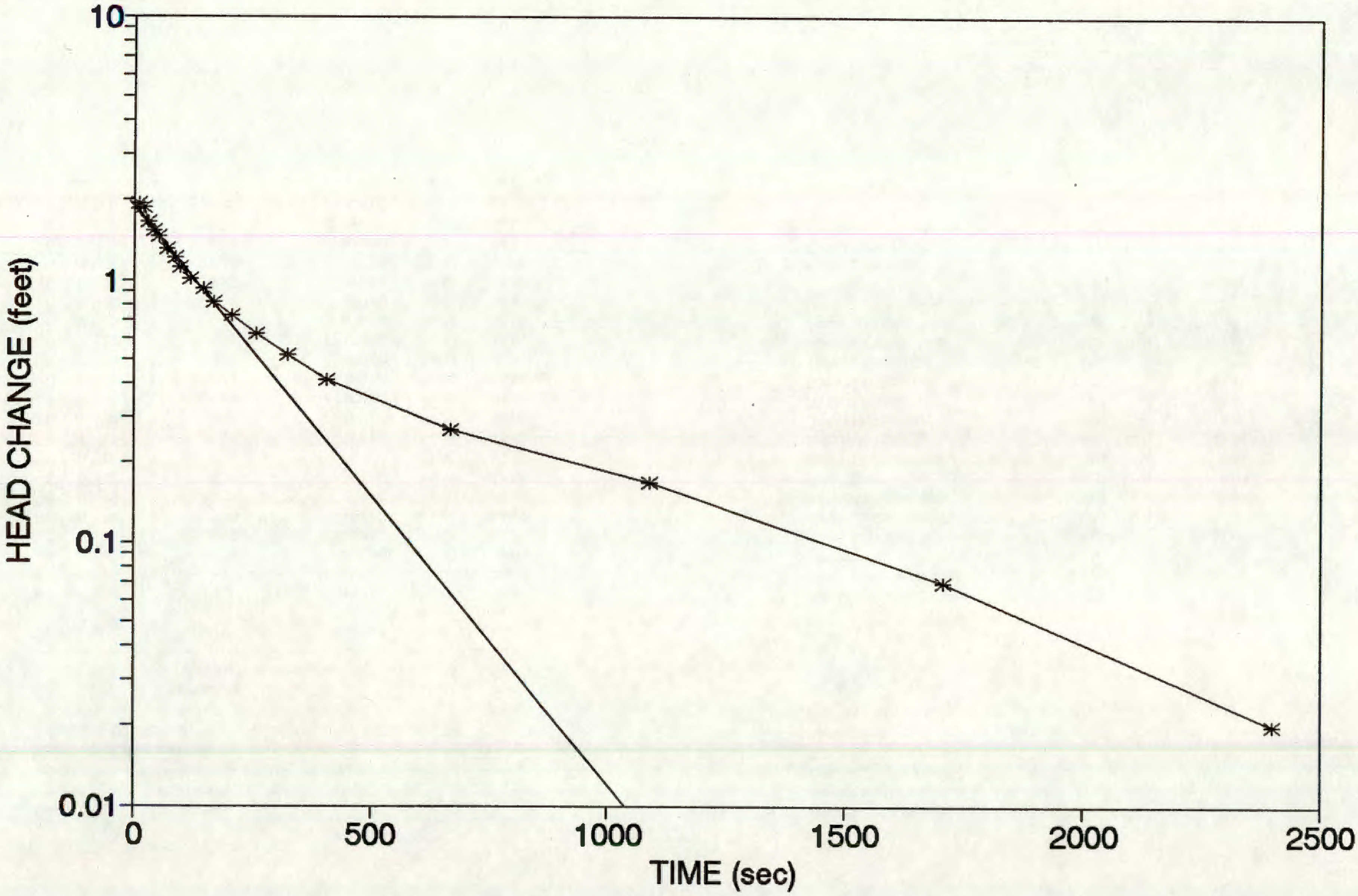
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	4.73		0.00	0.00	0.00
0	0	10	6.70		10.00	1.97	59.85
0	0	21	6.60		21.00	1.87	56.81
0	0	30	6.41		30.00	1.68	51.04
0	0	42	6.28		42.00	1.55	47.09
0	0	51	6.19		51.00	1.46	44.35
0	1	11	6.05		71.00	1.32	40.10
0	1	30	5.95		90.00	1.22	37.06
0	1	40	5.85		100.00	1.12	34.03
0	2	0	5.74		120.00	1.01	30.68
0	2	30	5.66		150.00	0.93	28.25
0	2	50	5.55		170.00	0.82	24.91
0	3	30	5.46		210.00	0.73	22.18
0	4	20	5.35		260.00	0.62	18.84
0	5	25	5.25		325.00	0.52	15.80
0	6	47	5.15		407.00	0.42	12.76
0	11	12	5.00		672.00	0.27	8.20
0	18	9	4.90		1089.00	0.17	5.16
0	28	28	4.80		1708.00	0.07	2.13
0	40	0	4.75		2400.00	0.02	0.61

Project: BAUSCH & LOMB, DEV. TEST 1
Project No.: 342.05
Well No.: BL-14D
Test Date: MARCH 28, 1994
Formation Tested: OVERBURDEN/TOP ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.5	76.20
Static water depth from stickup (ft)	4.73	144.17
Depth to bottom of screen from ground level (ft)	39.6	1207.01
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	8.00	243.84
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	1.97	60.05
Delta H at Time t (ft)	1.12	34.14
Time t (seconds)	100	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	5.1	2.4E-04
K, (Hvorslev Time Lag)	8.7	4.1E-04
K, (Hvorslev Variable Head)	8.6	4.1E-04

BAUSCH & LOMB
BL-14D RISING HEAD, DEV. TEST 1



SLUG TEST DATA REDUCTION

Well: BL-15D
Date: MARCH 28, 1994
Project: BAUSCH & LOMB DEV. TEST 1
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 1.45
Initial Time (seconds): 0.00

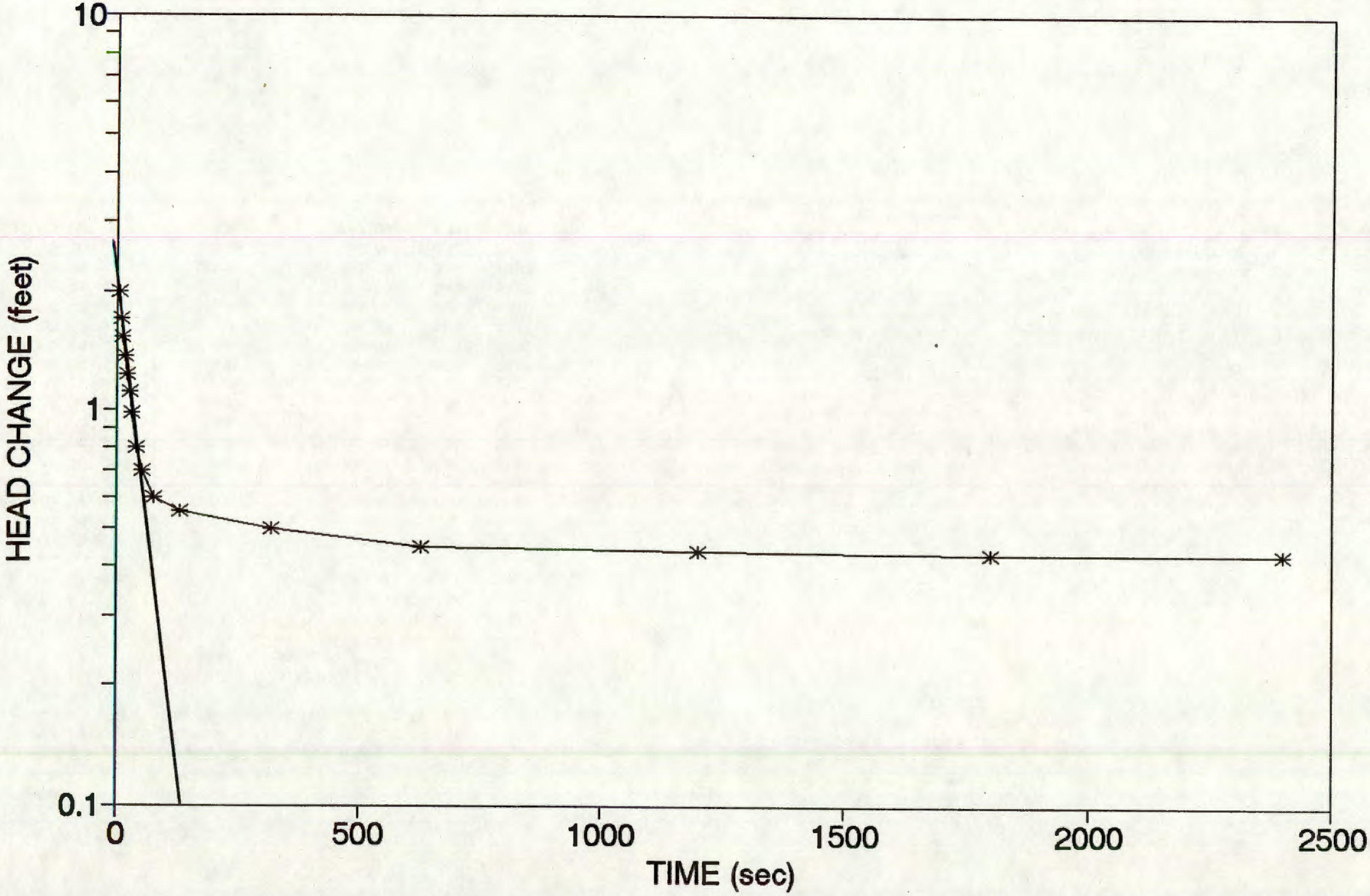
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	1.45		0.00	0.00	0.00
0	0	8	3.45		8.00	2.00	60.76
0	0	10	3.15		10.00	1.70	51.65
0	0	15	2.98		15.00	1.53	46.48
0	0	20	2.81		20.00	1.36	41.32
0	0	23	2.68		23.00	1.23	37.37
0	0	30	2.56		30.00	1.11	33.72
0	0	33	2.43		33.00	0.98	29.77
0	0	42	2.25		42.00	0.80	24.30
0	0	54	2.15		54.00	0.70	21.27
0	1	20	2.05		80.00	0.60	18.23
0	2	10	2.00		130.00	0.55	16.71
0	5	20	1.95		320.00	0.50	15.19
0	10	30	1.90		630.00	0.45	13.67
0	20	0	1.89		1200.00	0.44	13.37
0	30	0	1.88		1800.00	0.43	13.06
0	40	0	1.88		2400.00	0.43	13.06

Project: BAUSCH & LOMB, DEV. TEST 1
Project No.: 342.05
Well No.: BL-15D
Test Date: MARCH 28, 1994
Formation Tested: OVERBURDEN/TOP ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	1.8	56.08
Static water depth from stickup (ft)	1.45	44.20
Depth to bottom of screen from ground level (ft)	37.6	1146.05
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	2.00	60.96
Delta H at Time t (ft)	0.70	21.34
Time t (seconds)	54	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	14.9	7.0E-04
K, (Hvorslev Time Lag)	25.5	1.2E-03
K, (Hvorslev Variable Head)	25.4	1.2E-03

BAUSCH & LOMB
BL-15D RISING HEAD, DEV. TEST 1



SLUG TEST DATA REDUCTION

Well: BL-16S
Date: MARCH 29, 1994
Project: BAUSCH & LOMB DEV. TEST 1
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 2.12
Initial Time (seconds): 0.00

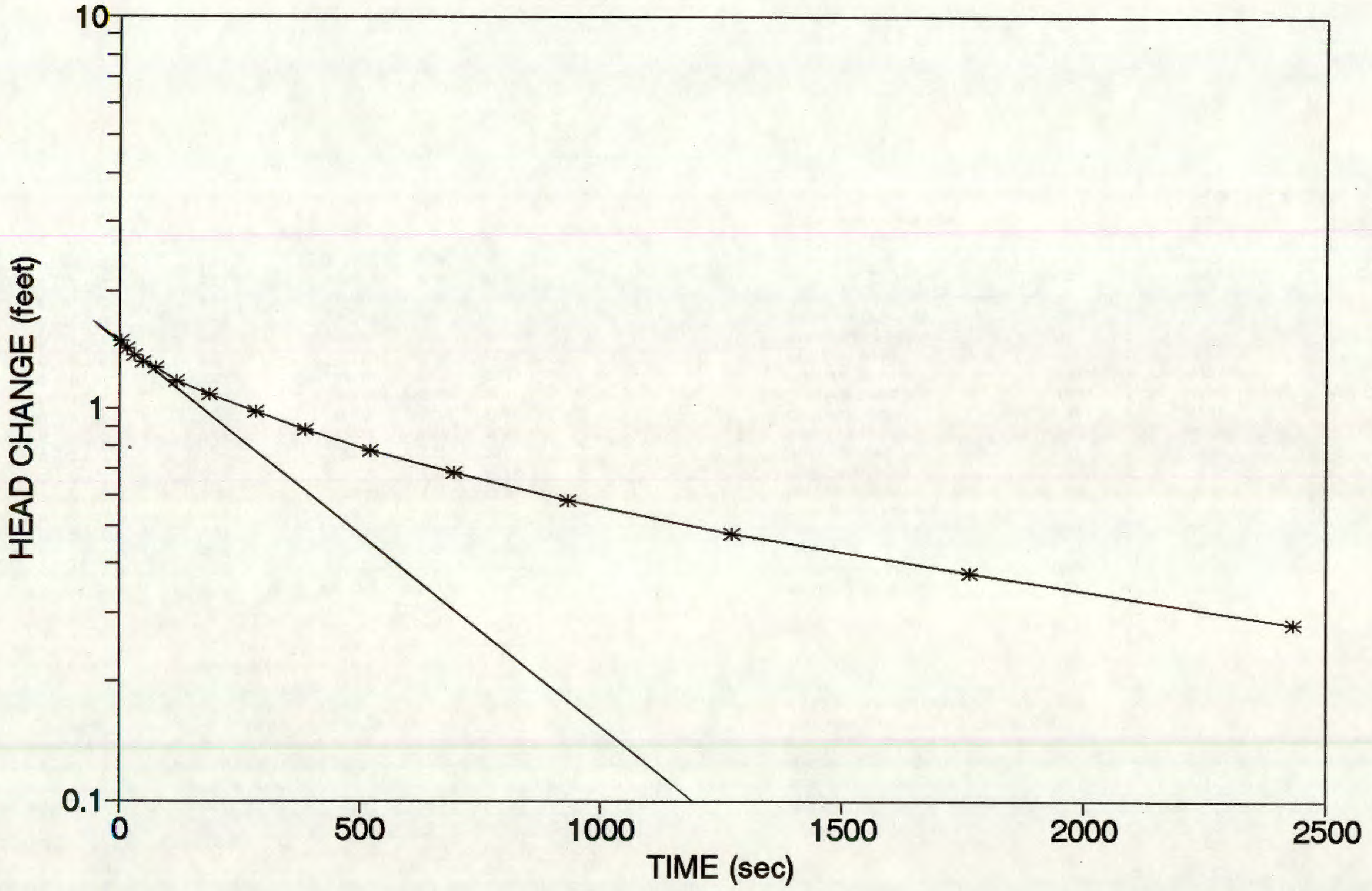
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	2.12		0.00	0.00	0.00
0	0	6	3.61		6.00	1.49	45.27
0	0	18	3.55		18.00	1.43	43.44
0	0	32	3.49		32.00	1.37	41.62
0	0	51	3.44		51.00	1.32	40.10
0	1	17	3.39		77.00	1.27	38.58
0	2	3	3.29		123.00	1.17	35.54
0	3	10	3.20		190.00	1.08	32.81
0	4	44	3.10		284.00	0.98	29.77
0	6	25	3.00		385.00	0.88	26.73
0	8	41	2.90		521.00	0.78	23.70
0	11	37	2.80		697.00	0.68	20.66
0	15	33	2.70		933.00	0.58	17.62
0	21	12	2.60		1272.00	0.48	14.58
0	29	27	2.50		1767.00	0.38	11.54
0	40	35	2.40		2435.00	0.28	8.51

Project: BAUSCH & LOMB, DEV. TEST 1
Project No.: 342.05
Well No.: BL-16S
Test Date: MARCH 28, 1994
Formation Tested: OVERBURDEN
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.4	73.15
Static water depth from stickup (ft)	2.12	64.62
Depth to bottom of screen from ground level (ft)	14.1	429.77
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0.	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	1.49	45.42
Delta H at Time t (ft)	1.27	38.71
Time t (seconds)	77	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	1.1	5.3E-05
K, (Hvorslev Time Lag)	2.7	1.3E-04
K, (Hvorslev Variable Head)	2.7	1.3E-04

BAUSCH & LOMB
BL-16S RISING HEAD, DEV. TEST 1



SLUG TEST DATA REDUCTION

Well: BL-8r
Date: MARCH 30, 1994
Project: BAUSCH & LOMB DEV. TEST 2
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 0.27
Initial Time (seconds): 0.00

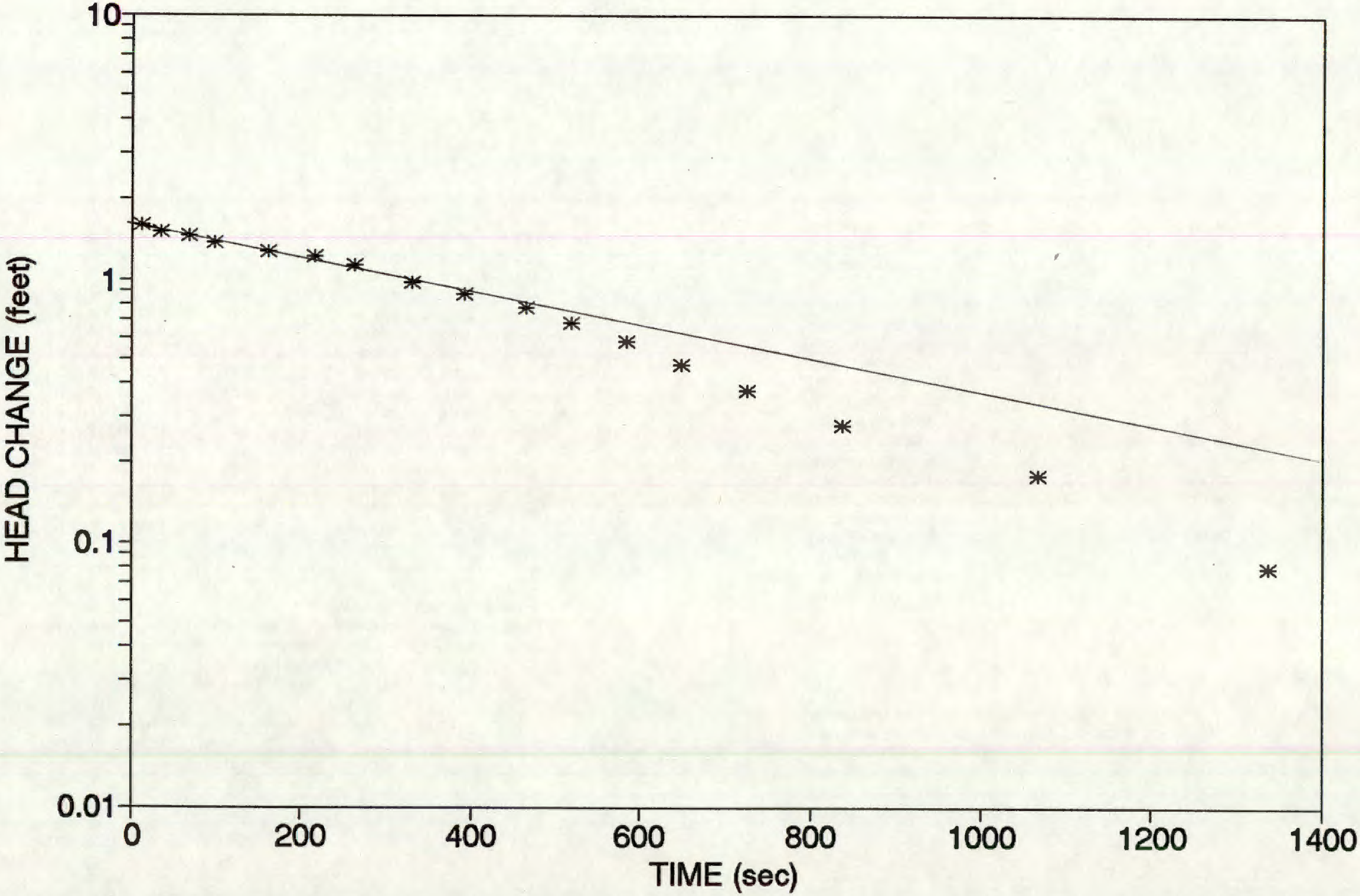
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	0.27		0.00	0.00	0.00
0	0	11	1.88		11.00	1.61	48.91
0	0	35	1.80		35.00	1.53	46.48
0	1	7	1.74		67.00	1.47	44.66
0	1	37	1.65		97.00	1.38	41.92
0	2	41	1.55		161.00	1.28	38.89
0	3	35	1.50		215.00	1.23	37.37
0	4	24	1.40		264.00	1.13	34.33
0	5	30	1.25		330.00	0.98	29.77
0	6	31	1.15		391.00	0.88	26.73
0	7	45	1.05		465.00	0.78	23.70
0	8	39	0.95		519.00	0.68	20.66
0	9	43	0.85		583.00	0.58	17.62
0	10	48	0.75		648.00	0.48	14.58
0	12	4	0.65		724.00	0.38	11.54
0	13	58	0.55		838.00	0.28	8.51
0	17	47	0.45		1067.00	0.18	5.47
0	22	18	0.35		1338.00	0.08	2.43

Project: BAUSCH & LOMB, DEV. TEST 2
Project N 342.05
Well No.: BL-8r
Test Date: MARCH 30, 1994
Formation Tested: OVERBURDEN/ TOP ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	0.0	0.00
Static water depth from stickup (ft)	0.27	8.23
Depth to bottom of screen from ground level (ft)	24.1	734.57
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	30	914.40
Delta H at Time 0 (ft)	1.61	49.07
Delta H at Time t (ft)	1.28	39.01
Time t (seconds)	161	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	0.9	4.2E-05
K, (Hvorslev Time Lag)	1.9	8.8E-05
K, (Hvorslev Variable Head)	1.9	8.8E-05

BAUSCH & LOMB FRAME CENTER
BL-8r RISING HEAD, DEV. TEST 2



SLUG TEST DATA REDUCTION

Well: BL-13S
Date: MARCH 30, 1994
Project: BAUSCH & LOMB DEV. TEST 2
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 5.05
Initial Time (seconds): 0.00

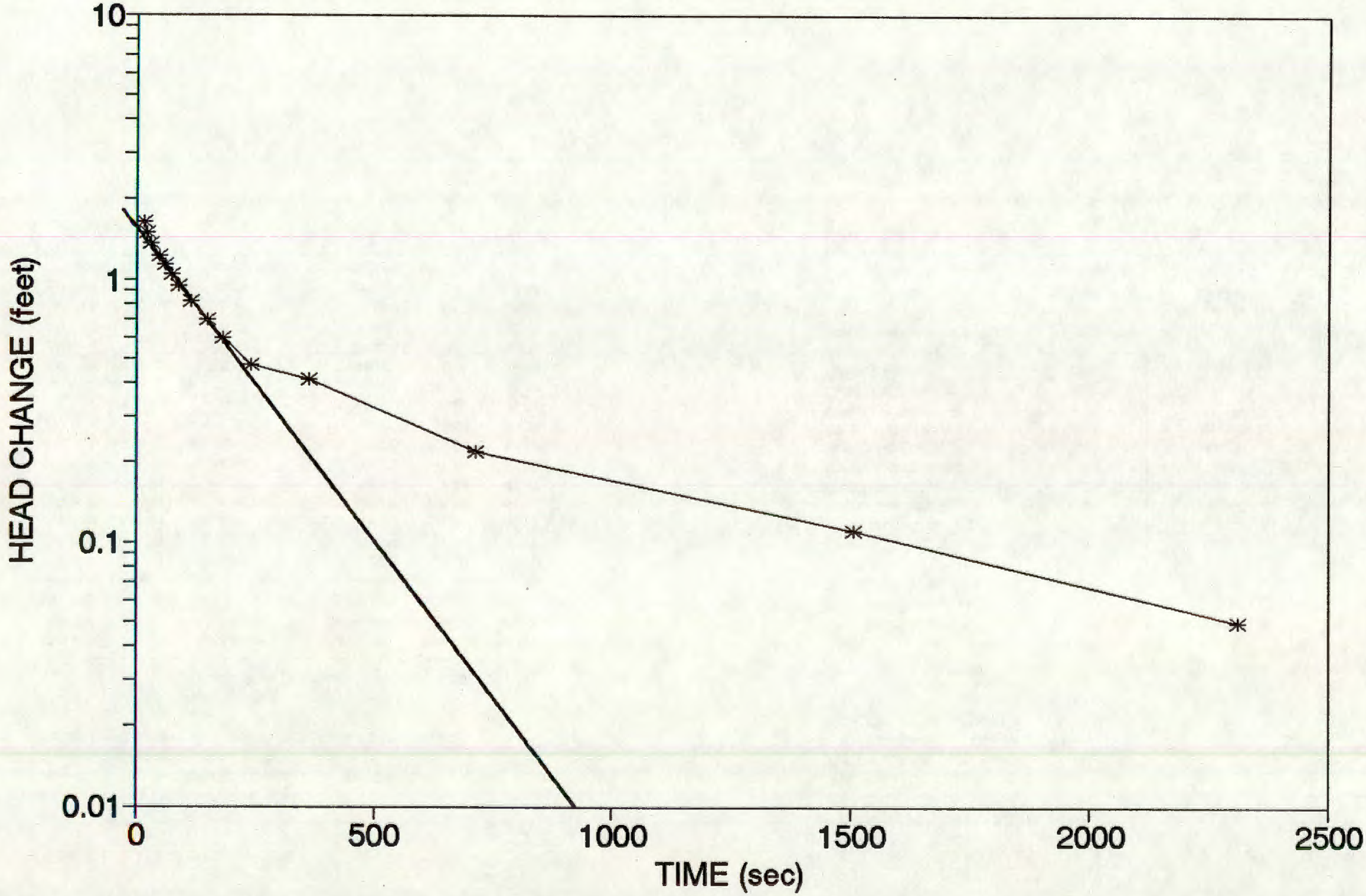
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	5.05		0.00	0.00	0.00
0	0	16	6.70		16.00	1.65	50.13
0	0	24	6.55		24.00	1.50	45.57
0	0	31	6.41		31.00	1.36	41.32
0	0	50	6.28		50.00	1.23	37.37
0	1	0	6.19		60.00	1.14	34.63
0	1	13	6.10		73.00	1.05	31.90
0	1	30	5.99		90.00	0.94	28.56
0	1	55	5.87		115.00	0.82	24.91
0	2	30	5.75		150.00	0.70	21.27
0	3	0	5.65		180.00	0.60	18.23
0	4	0	5.52		240.00	0.47	14.28
0	6	4	5.47		364.00	0.42	12.76
0	11	54	5.27		714.00	0.22	6.68
0	25	8	5.16		1508.00	0.11	3.34
0	38	30	5.10		2310.00	0.05	1.52

Project: BAUSCH & LOMB, DEV. TEST 2
Project N 342.05
Well No.: BL-13S
Test Date: MARCH 30, 1994
Formation Tested: OVERBURDEN
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.7	82.30
Static water depth from stickup (ft)	5.05	153.92
Depth to bottom of screen from ground level (ft)	15.1	460.25
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	30	914.40
Delta H at Time 0 (ft)	1.50	45.72
Delta H at Time t (ft)	0.47	14.33
Time t (seconds)	240	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	2.6	1.2E-04
K, (Hvorslev Time Lag)	6.3	3.0E-04
K, (Hvorslev Variable Head)	6.3	3.0E-04

BAUSCH & LOMB
BL-13S RISING HEAD, DEV. TEST 2



SLUG TEST DATA REDUCTION

Well: BL-13D
Date: MARCH 30, 1994
Project: BAUSCH & LOMB DEV. TEST 2
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 4.81
Initial Time (seconds): 0.00

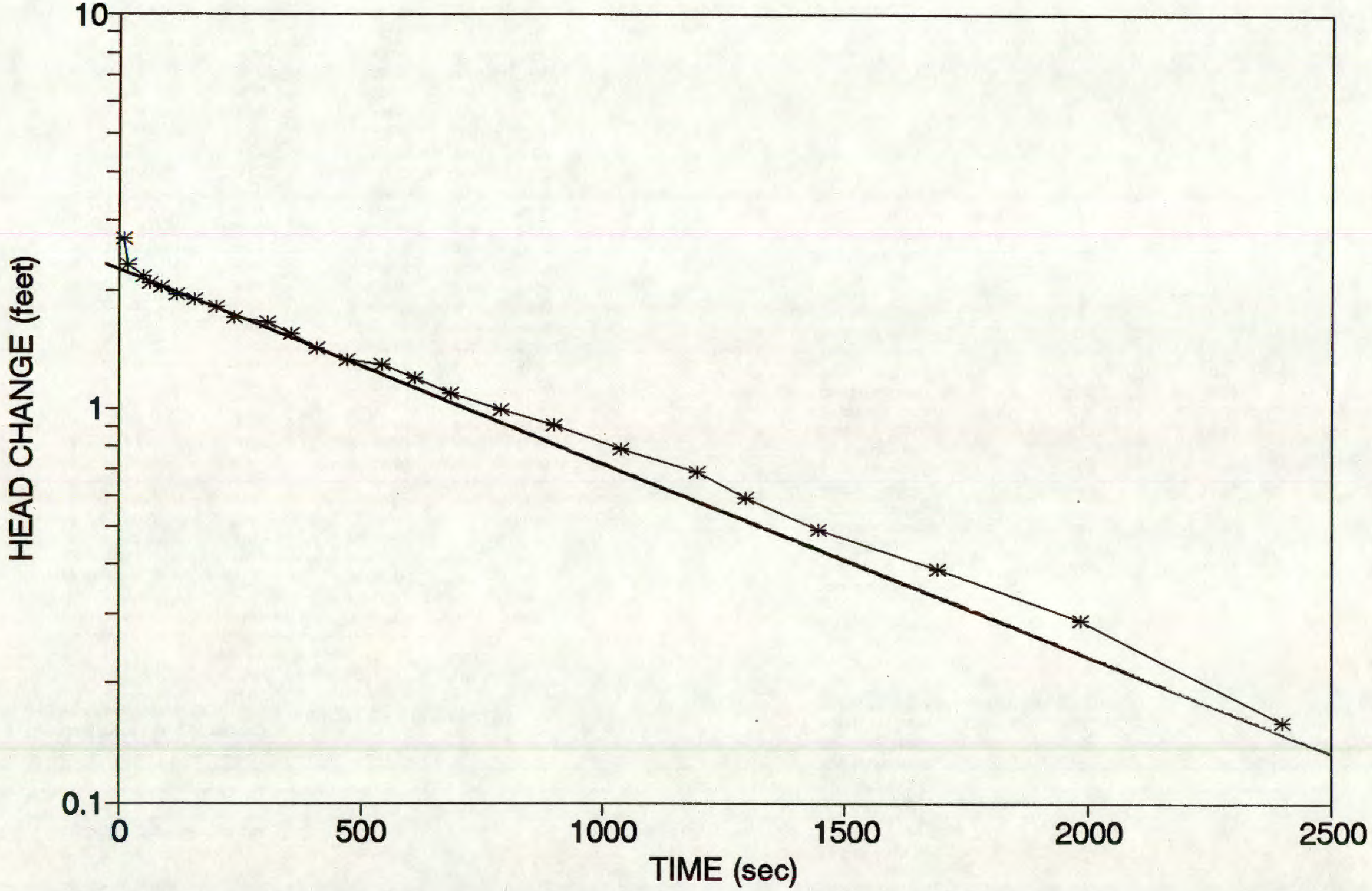
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	4.81		0.00	0.00	0.00
0	0	10	7.52		10.00	2.71	82.33
0	0	20	7.14		20.00	2.33	70.79
0	0	51	6.97		51.00	2.16	65.62
0	1	4	6.90		64.00	2.09	63.49
0	1	27	6.84		87.00	2.03	61.67
0	1	58	6.75		118.00	1.94	58.94
0	2	35	6.71		155.00	1.90	57.72
0	3	21	6.62		201.00	1.81	54.99
0	4	0	6.51		240.00	1.70	51.65
0	5	5	6.47		305.00	1.66	50.43
0	5	55	6.35		355.00	1.54	46.79
0	6	48	6.24		408.00	1.43	43.44
0	7	51	6.14		471.00	1.33	40.41
0	9	2	6.10		542.00	1.29	39.19
0	10	11	6.00		611.00	1.19	36.15
0	11	24	5.90		684.00	1.09	33.11
0	13	9	5.80		789.00	0.99	30.08
0	15	0	5.72		900.00	0.91	27.65
0	17	19	5.60		1039.00	0.79	24.00
0	19	57	5.50		1197.00	0.69	20.96
0	21	36	5.40		1296.00	0.59	17.92
0	24	4	5.30		1444.00	0.49	14.89
0	28	12	5.20		1692.00	0.39	11.85
0	33	3	5.10		1983.00	0.29	8.81
0	40	0	4.97		2400.00	0.16	4.86

Project: BAUSCH & LOMB, DEV. TEST 2
Project N 342.05
Well No.: BL-13D
Test Date: MARCH 30, 1994
Formation Tested: OVERBURDEN/ TOP ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.8	85.34
Static water depth from stickup (ft)	4.81	146.61
Depth to bottom of screen from ground level (ft)	35.0	1066.80
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	2.20	67.06
Delta H at Time t (ft)	1.43	43.59
Time t (seconds)	408	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	0.7	3.3E-05
K, (Hvorslev Time Lag)	1.4	6.5E-05
K, (Hvorslev Variable Head)	1.4	6.5E-05

BAUSCH & LOMB
BL-13D RISING HEAD, DEV. TEST 2



SLUG TEST DATA REDUCTION

Well: BL-14S
Date: MARCH 30, 1994
Project: BAUSCH & LOMB DEV. TEST 2
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 2.13
Initial Time (seconds): 0.00

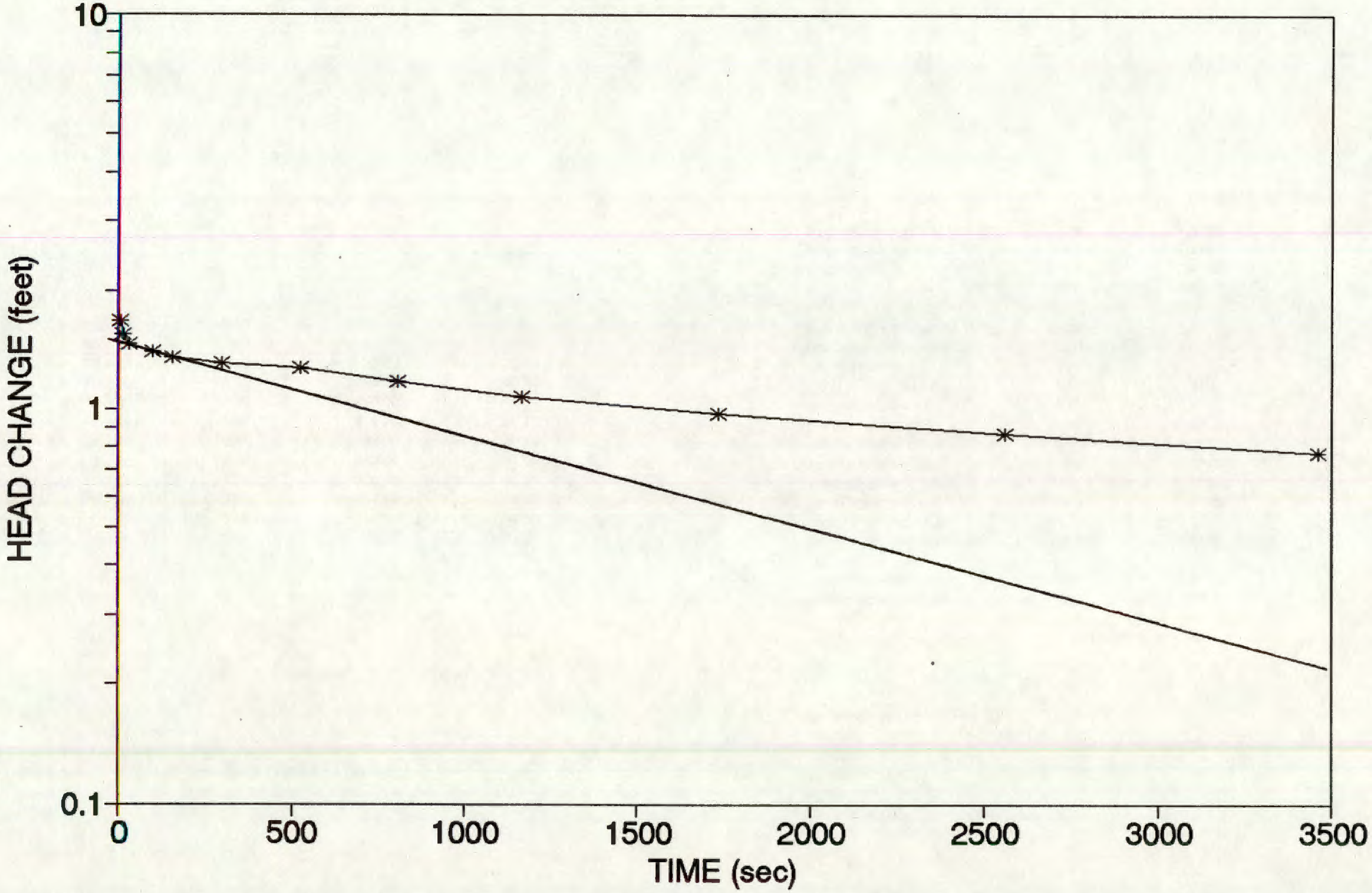
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	2.13		0.00	0.00	0.00
0	0	8	3.81		8.00	1.68	51.04
0	0	15	3.67		15.00	1.54	46.79
0	0	31	3.60		31.00	1.47	44.66
0	1	40	3.53		100.00	1.40	42.53
0	2	39	3.48		159.00	1.35	41.01
0	4	58	3.44		298.00	1.31	39.80
0	8	48	3.40		528.00	1.27	38.58
0	13	30	3.30		810.00	1.17	35.54
0	19	29	3.20		1169.00	1.07	32.51
0	28	59	3.10		1739.00	0.97	29.47
0	42	42	3.00		2562.00	0.87	26.43
0	57	42	2.90		3462.00	0.77	23.39

Project: BAUSCH & LOMB, DEV. TEST 2
Project N 342.05
Well No.: BL-14S
Test Date: MARCH 30, 1994
Formation Tested: OVERBURDEN
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.5	76.20
Static water depth from stickup (ft)	2.13	64.92
Depth to bottom of screen from ground level (ft)	24.0	731.52
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	8.00	243.84
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	1.47	44.81
Delta H at Time t (ft)	1.35	41.15
Time t (seconds)	159	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	0.4	1.8E-05
K, (Hvorslev Time Lag)	0.8	3.9E-05
K, (Hvorslev Variable Head)	0.8	3.9E-05

BAUSCH & LOMB
BL-14S RISING HEAD, DEV. TEST 2



SLUG TEST DATA REDUCTION

Well: BL-14D
Date: MARCH 30, 1994
Project: BAUSCH & LOMB DEV. TEST 2
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 4.68
Initial Time (seconds): 0.00

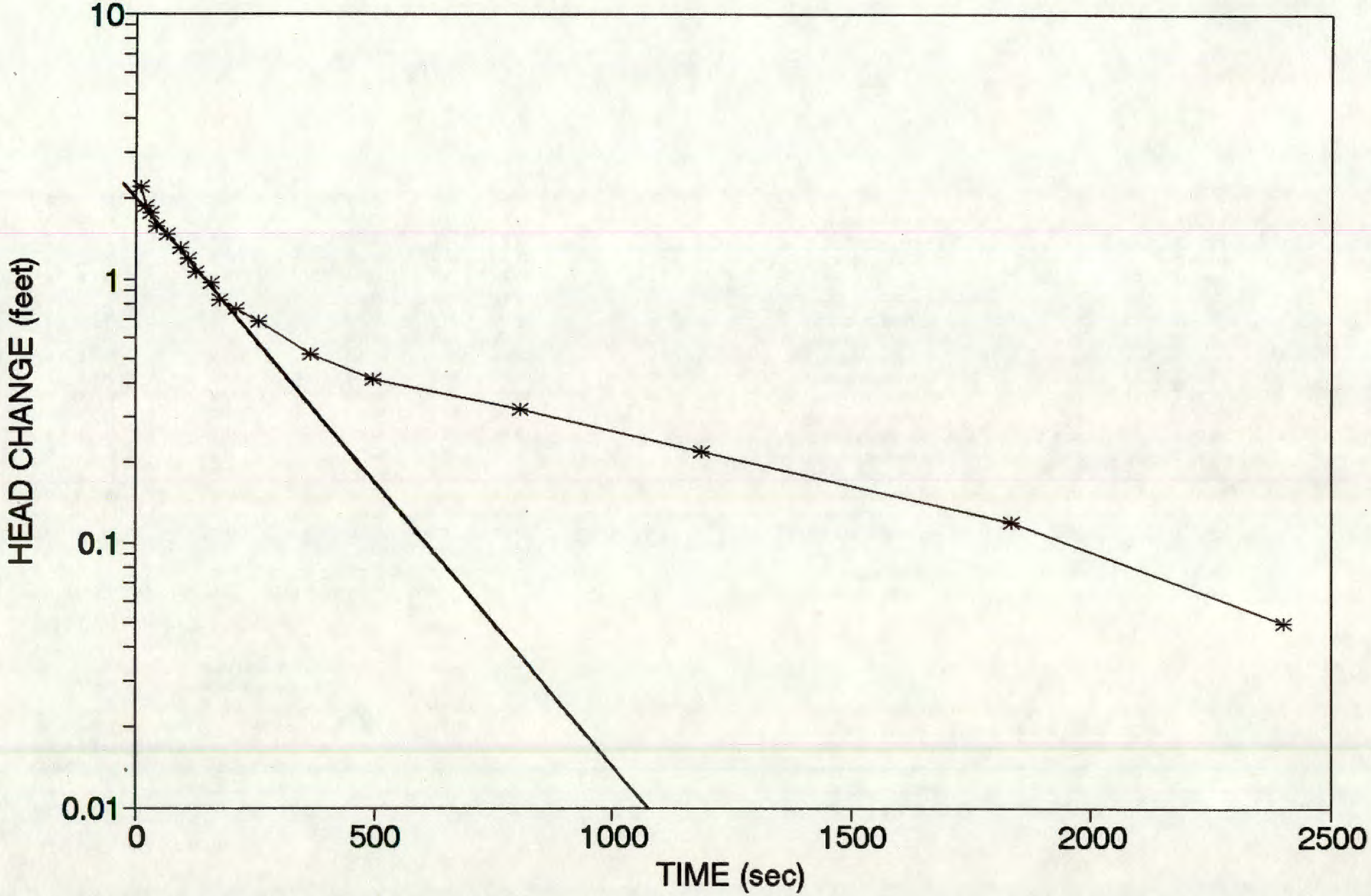
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	4.68		0.00	0.00	0.00
0	0	12	6.91		12.00	2.23	67.75
0	0	20	6.57		20.00	1.89	57.42
0	0	30	6.47		30.00	1.79	54.38
0	0	44	6.27		44.00	1.59	48.30
0	1	4	6.16		64.00	1.48	44.96
0	1	33	5.99		93.00	1.31	39.80
0	1	50	5.87		110.00	1.19	36.15
0	2	5	5.74		125.00	1.06	32.20
0	2	37	5.65		157.00	0.97	29.47
0	2	55	5.51		175.00	0.83	25.22
0	3	30	5.45		210.00	0.77	23.39
0	4	17	5.37		257.00	0.69	20.96
0	6	6	5.20		366.00	0.52	15.80
0	8	19	5.10		499.00	0.42	12.76
0	13	27	5.00		807.00	0.32	9.72
0	19	47	4.90		1187.00	0.22	6.68
0	30	35	4.80		1835.00	0.12	3.65
0	40	0	4.73		2400.00	0.05	1.52

Project: BAUSCH & LOMB, DEV. TEST 2
Project N 342.05
Well No.: BL-14D
Test Date: MARCH 30, 1994
Formation Tested: OVERBURDEN/ TOP ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.5	76.20
Static water depth from stickup (ft)	4.68	142.65
Depth to bottom of screen from ground level (ft)	39.6	1207.01
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	8.00	243.84
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	2.00	60.96
Delta H at Time t (ft)	0.97	29.57
Time t (seconds)	157	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	4.2	2.0E-04
K, (Hvorslev Time Lag)	7.1	3.3E-04
K, (Hvorslev Variable Head)	7.0	3.3E-04

BAUSCH & LOMB
BL-14D RISING HEAD, DEV. TEST 2



SLUG TEST DATA REDUCTION

Well: BL-15D
Date: MARCH 30, 1994
Project: BAUSCH & LOMB DEV. TEST 2
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 1.48
Initial Time (seconds): 0.00

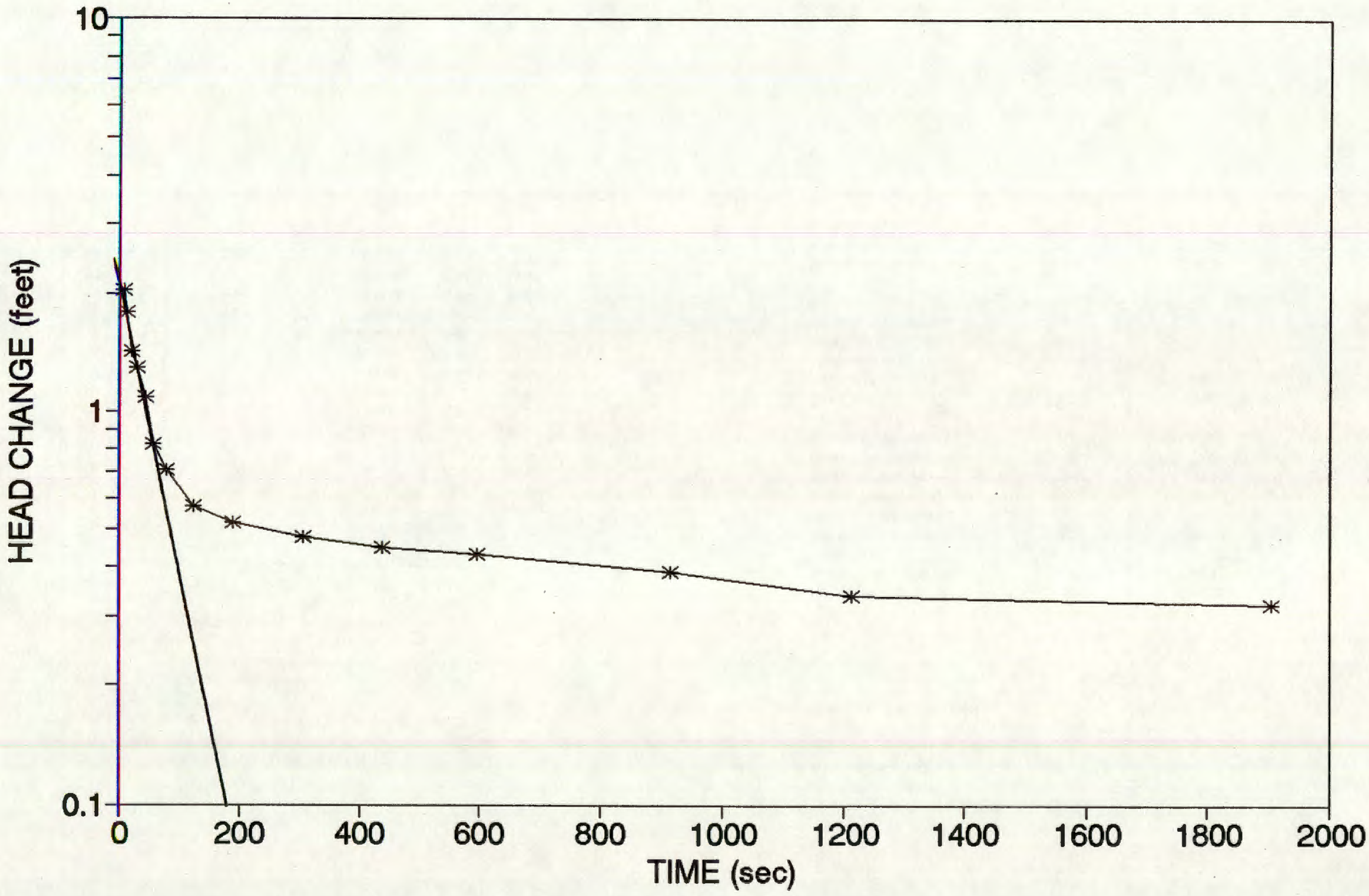
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	1.48		0.00	0.00	0.00
0	0	9	3.51		9.00	2.03	61.67
0	0	14	3.27		14.00	1.79	54.38
0	0	21	2.90		21.00	1.42	43.14
0	0	30	2.77		30.00	1.29	39.19
0	0	45	2.56		45.00	1.08	32.81
0	0	57	2.30		57.00	0.82	24.91
0	1	19	2.19		79.00	0.71	21.57
0	2	4	2.05		124.00	0.57	17.32
0	3	10	2.00		190.00	0.52	15.80
0	5	7	1.96		307.00	0.48	14.58
0	7	18	1.93		438.00	0.45	13.67
0	9	58	1.91		598.00	0.43	13.06
0	15	16	1.87		916.00	0.39	11.85
0	20	12	1.82		1212.00	0.34	10.33
0	31	45	1.80		1905.00	0.32	9.72

Project: BAUSCH & LOMB, DEV. TEST 2
Project N 342.05
Well No.: BL-15D
Test Date: MARCH 30, 1994
Formation Tested: OVERBURDEN/ TOP ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.6	79.25
Static water depth from stickup (ft)	1.48	45.11
Depth to bottom of screen from ground level (ft)	37.6	1146.05
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	2.10	64.01
Delta H at Time t (ft)	1.08	32.92
Time t (seconds)	54	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	9.5	4.5E-04
K, (Hvorslev Time Lag)	16.2	7.6E-04
K, (Hvorslev Variable Head)	16.1	7.6E-04

BAUSCH & LOMB
BL-15D RISING HEAD, DEV. TEST 2



SLUG TEST DATA REDUCTION

Well: BL-16S
Date: MARCH 30, 1994
Project: BAUSCH & LOMB DEV. TEST 2
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: (1) 3.0' LONG, 0.2' O.D. BAILER

Initial Depth to water (ft): 2.09
Initial Time (seconds): 0.00

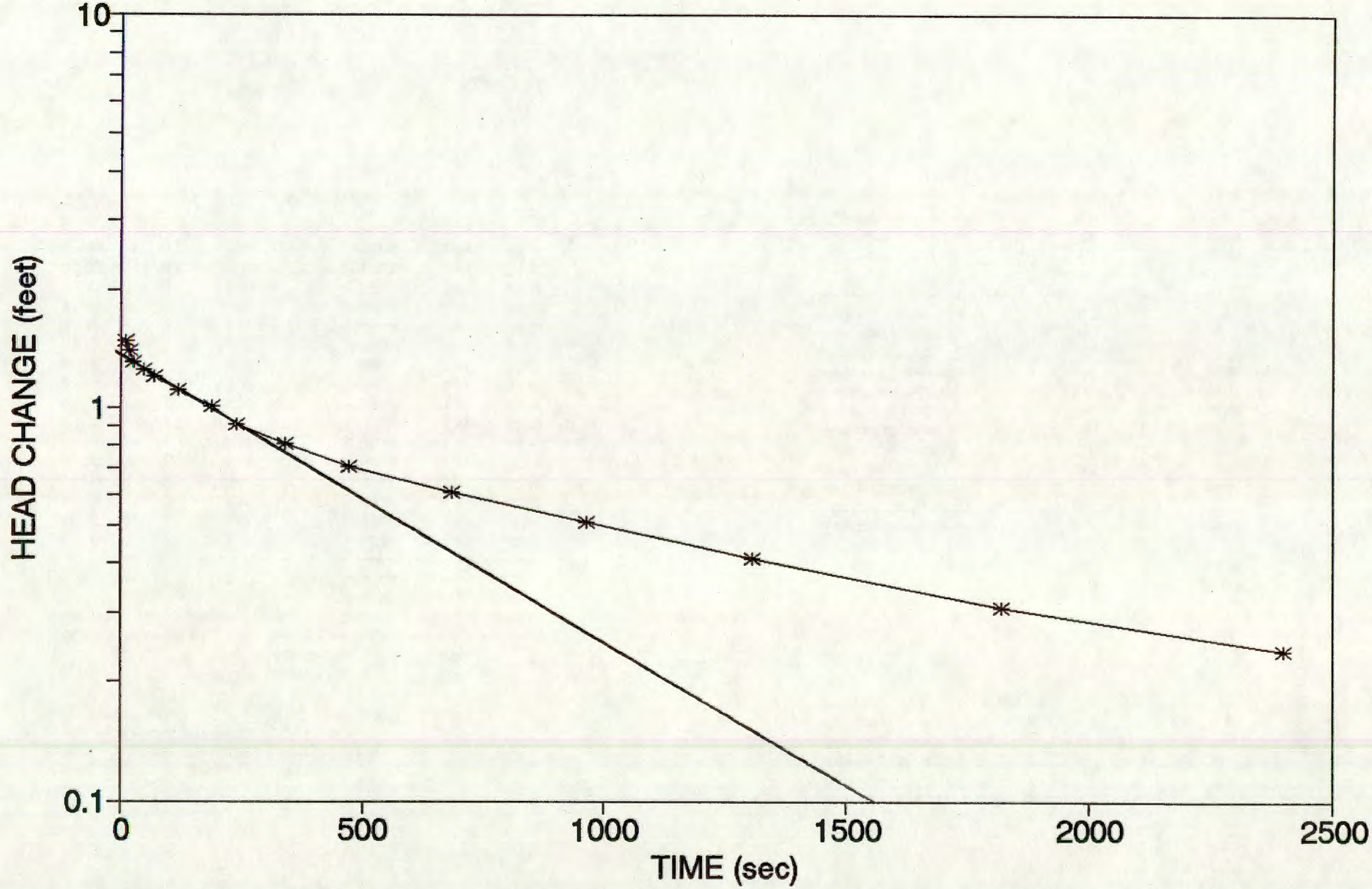
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	2.09		0.00	0.00	0.00
0	0	10	3.57		10.00	1.48	44.96
0	0	21	3.49		21.00	1.40	42.53
0	0	27	3.40		27.00	1.31	39.80
0	0	49	3.34		49.00	1.25	37.98
0	1	9	3.30		69.00	1.21	36.76
0	1	59	3.20		119.00	1.11	33.72
0	3	7	3.10		187.00	1.01	30.68
0	3	58	3.00		238.00	0.91	27.65
0	5	37	2.90		337.00	0.81	24.61
0	7	50	2.80		470.00	0.71	21.57
0	11	24	2.70		684.00	0.61	18.53
0	16	6	2.60		966.00	0.51	15.49
0	21	47	2.50		1307.00	0.41	12.46
0	30	17	2.40		1817.00	0.31	9.42
0	40	0	2.33		2400.00	0.24	7.29

Project: BAUSCH & LOMB, DEV. TEST 2
Project N 342.05
Well No.: BL-16S
Test Date: MARCH 30, 1994
Formation Tested: OVERBURDEN
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.4	73.15
Static water depth from stickup (ft)	2.09	63.70
Depth to bottom of screen from ground level (ft)	14.1	429.77
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	1.40	42.67
Delta H at Time t (ft)	1.21	36.88
Time t (seconds)	69	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	1.1	5.4E-05
K, (Hvorslev Time Lag)	2.8	1.3E-04
K, (Hvorslev Variable Head)	2.8	1.3E-04

BAUSCH & LOMB
BL-16S RISING HEAD, DEV. TEST 2



SLUG TEST DATA REDUCTION

Well: BL-4D
Date: APRIL 14, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: NA

Reference Depth (ft): 0.00
Initial Time (seconds): 0.00

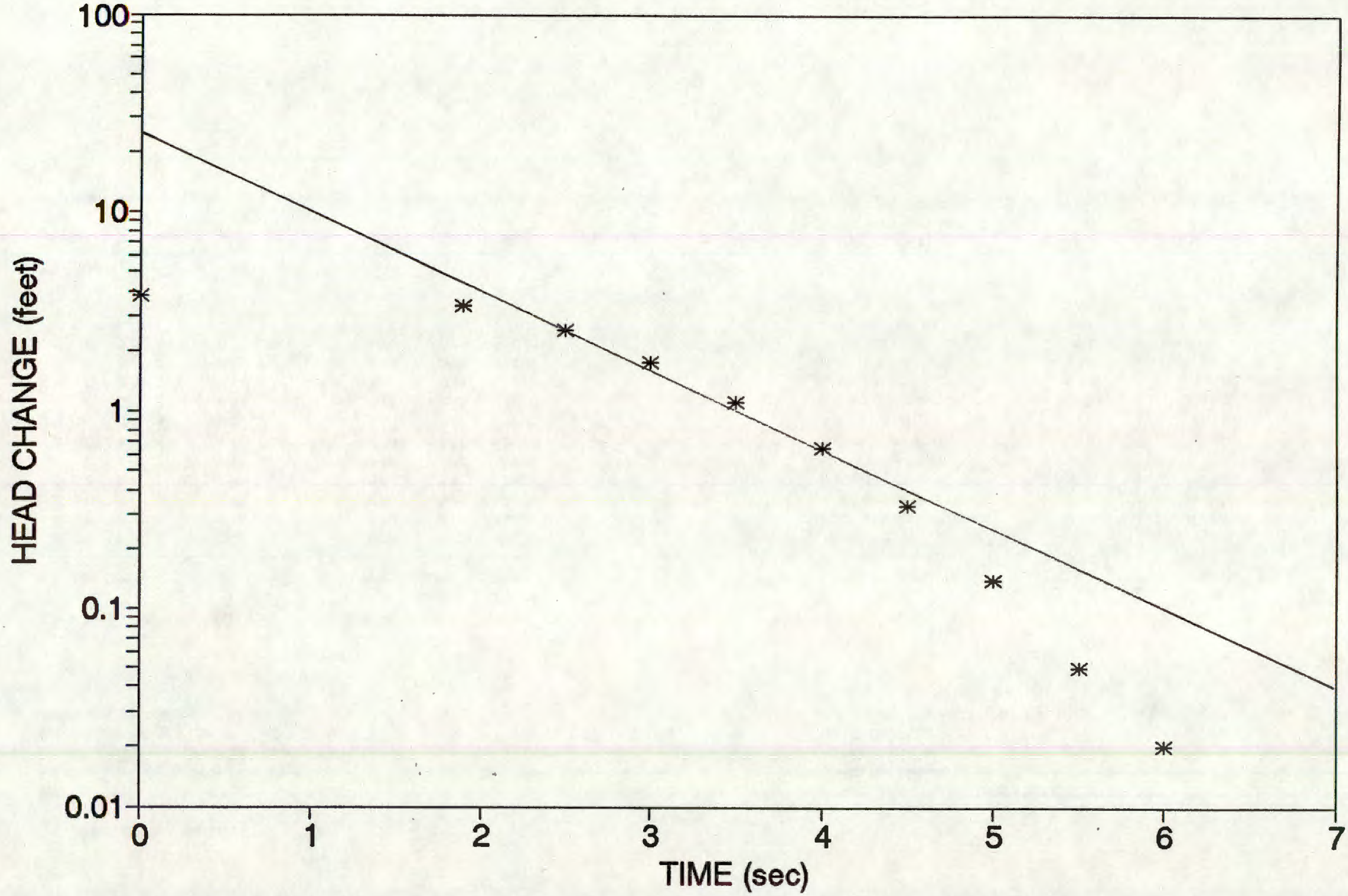
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	0.00		0.00	0.00	0.00
0	0	2	3.76		1.90	3.76	114.23
0	0	3	3.39		2.50	3.39	102.99
0	0	3	2.58		3.00	2.58	78.38
0	0	4	1.77		3.50	1.77	53.77
0	0	4	1.12		4.00	1.12	34.03
0	0	5	0.65		4.50	0.65	19.75
0	0	5	0.33		5.00	0.33	10.03
0	0	6	0.14		5.50	0.14	4.25
0	0	6	0.05		6.00	0.05	1.52
0	0	7	0.02		6.50	0.02	0.61

Project: BAUSCH & LOMB FRAME CENTER
Project N 342.05
Well No.: BL-4D
Test Date: APRIL 14, 1994
Formation OVERBURDEN/TOP OF ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	0.0	0.00
Static water depth from stickup (ft)	2.70	82.30
Depth to bottom of screen from ground level (ft)	34.4	1048.51
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	5.00	152.40
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	3.76	114.60
Delta H at Time t (ft)	1.12	34.14
Time t (seconds)	4	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	319.3	1.5E-02
K, (Hvorslev Time Lag)	680.6	3.2E-02
K, (Hvorslev Variable Head)	676.7	3.2E-02

BAUSCH & LOMB FRAME CENTER
BL-4D RISING HEAD TEST



SLUG TEST DATA REDUCTION

Well: BL-5D
Date: APRIL 14, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: NA

Reference Depth (ft): 0.00
Initial Time (seconds): 0.00

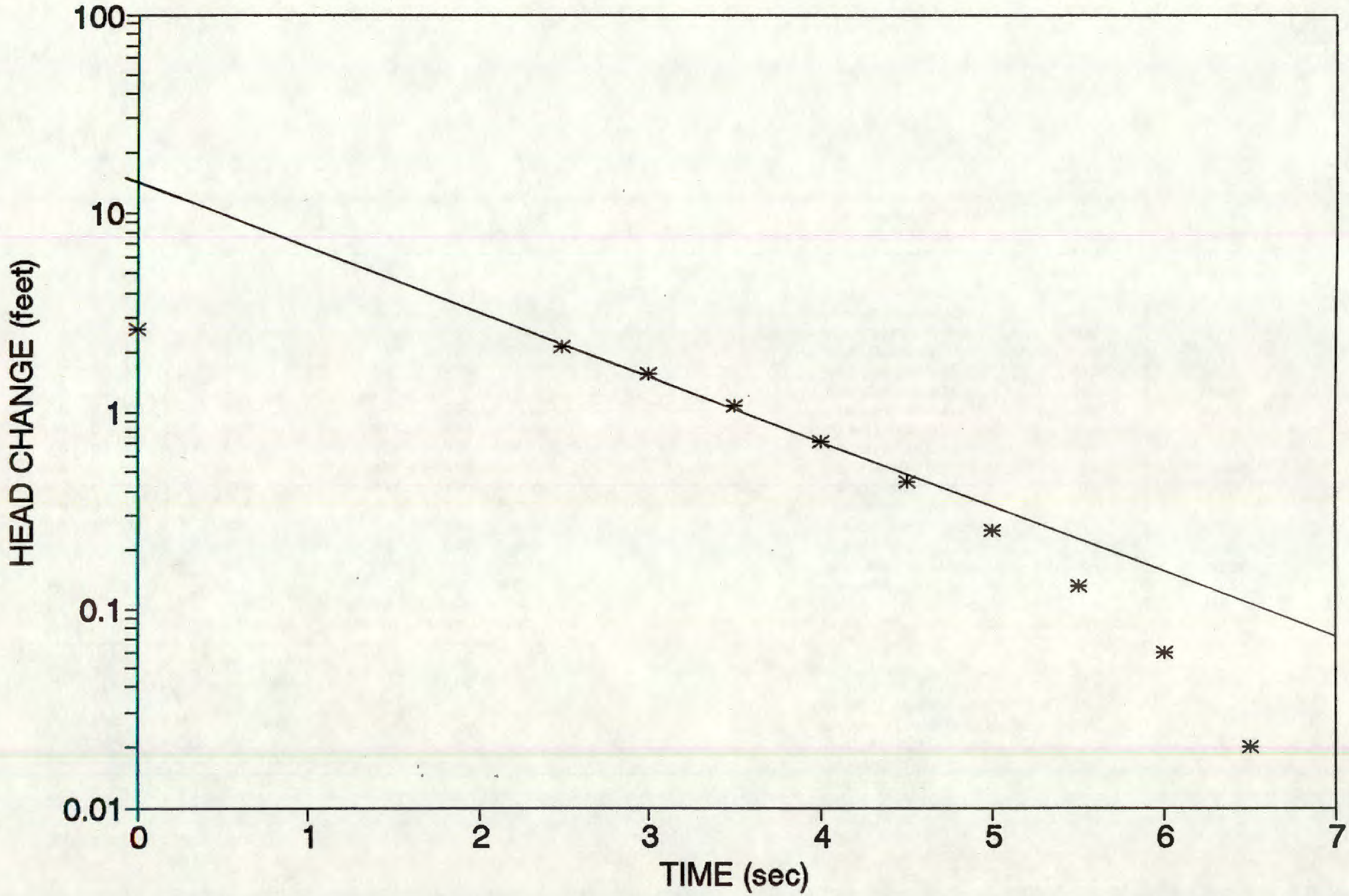
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	0.00		0.00	0.00	0.00
0	0	3	2.59		2.50	2.59	78.68
0	0	3	2.14		3.00	2.14	65.01
0	0	4	1.57		3.50	1.57	47.70
0	0	4	1.08		4.00	1.08	32.81
0	0	5	0.71		4.50	0.71	21.57
0	0	5	0.44		5.00	0.44	13.37
0	0	6	0.25		5.50	0.25	7.60
0	0	6	0.13		6.00	0.13	3.95
0	0	7	0.06		6.50	0.06	1.82
0	0	7	0.02		7.00	0.02	0.61

Project: BAUSCH & LOMB FRAME CENTER
Project N 342.05
Well No.: BL-5D
Test Date: APRIL 14, 1994
Formation OVERBURDEN/TOP OF ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	0.0	0.00
Static water depth from stickup (ft)	1.94	59.13
Depth to bottom of screen from ground level (ft)	28.4	865.63
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	5.00	152.40
Depth to Boundary	30	914.40
Delta H at Time 0 (ft)	2.59	78.94
Delta H at Time t (ft)	1.08	32.92
Time t (seconds)	4	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	286.5	1.4E-02
K, (Hvorslev Time Lag)	491.6	2.3E-02
K, (Hvorslev Variable Head)	488.8	2.3E-02

BAUSCH & LOMB FRAME CENTER
BL-5D RISING HEAD TEST



SLUG TEST DATA REDUCTION

Well: BL-8r
Date: APRIL 20, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 0.55
Initial Time (seconds): 0.00

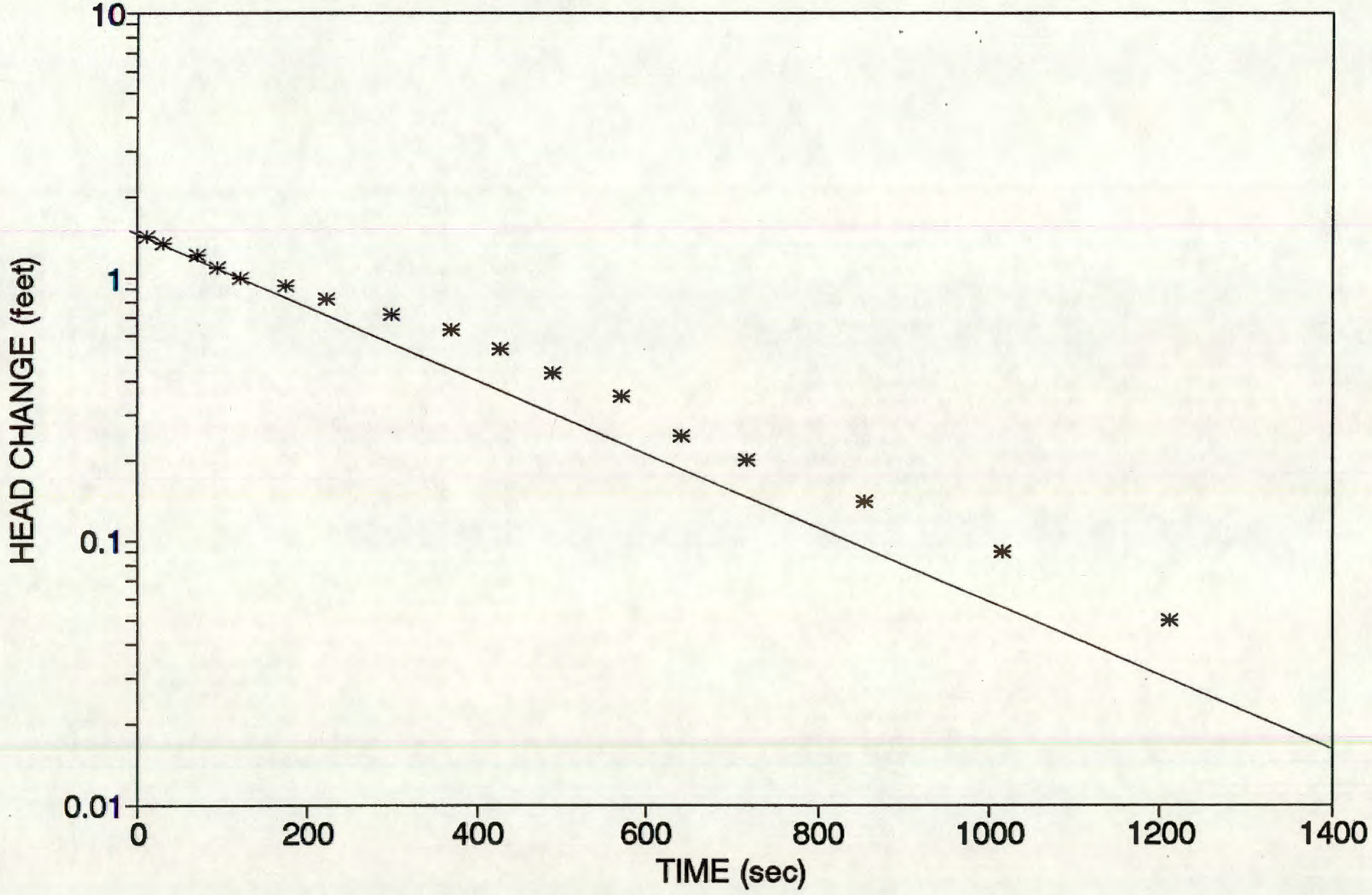
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	0.55		0.00	0.00	0.00
0	0	12	1.97		12.00	1.42	43.14
0	0	30	1.90		30.00	1.35	41.01
0	1	11	1.77		71.00	1.22	37.06
0	1	34	1.64		94.00	1.09	33.11
0	2	0	1.55		120.00	1.00	30.38
0	2	55	1.48		175.00	0.93	28.25
0	3	42	1.37		222.00	0.82	24.91
0	5	1	1.27		301.00	0.72	21.87
0	6	10	1.18		370.00	0.63	19.14
0	7	7	1.08		427.00	0.53	16.10
0	8	11	0.98		491.00	0.43	13.06
0	9	31	0.90		571.00	0.35	10.63
0	10	42	0.80		642.00	0.25	7.60
0	11	58	0.75		718.00	0.20	6.08
0	14	15	0.69		855.00	0.14	4.25
0	16	55	0.64		1015.00	0.09	2.73
0	20	12	0.60		1212.00	0.05	1.52

Project: BAUSCH & LOMB FRAME CENTER
Project N 342.05
Well No.: BL-8r
Test Date: APRIL 20, 1994
Formation Tested: OVERBURDEN/ TOP OF ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.0	60.96
Static water depth from stickup (ft)	0.55	16.76
Depth to bottom of screen from ground level (ft)	24.1	734.57
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	30	914.40
Delta H at Time 0 (ft)	1.42	43.28
Delta H at Time t (ft)	1.00	30.48
Time t (seconds)	120	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	1.8	8.6E-05
K, (Hvorslev Time Lag)	3.8	1.8E-04
K, (Hvorslev Variable Head)	3.8	1.8E-04

BAUSCH & LOMB FRAME CENTER
BL-8r RISING HEAD TEST



SLUG TEST DATA REDUCTION

Well: BL-13S
Date: APRIL 20, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 5.21
Initial Time (seconds): 0.00

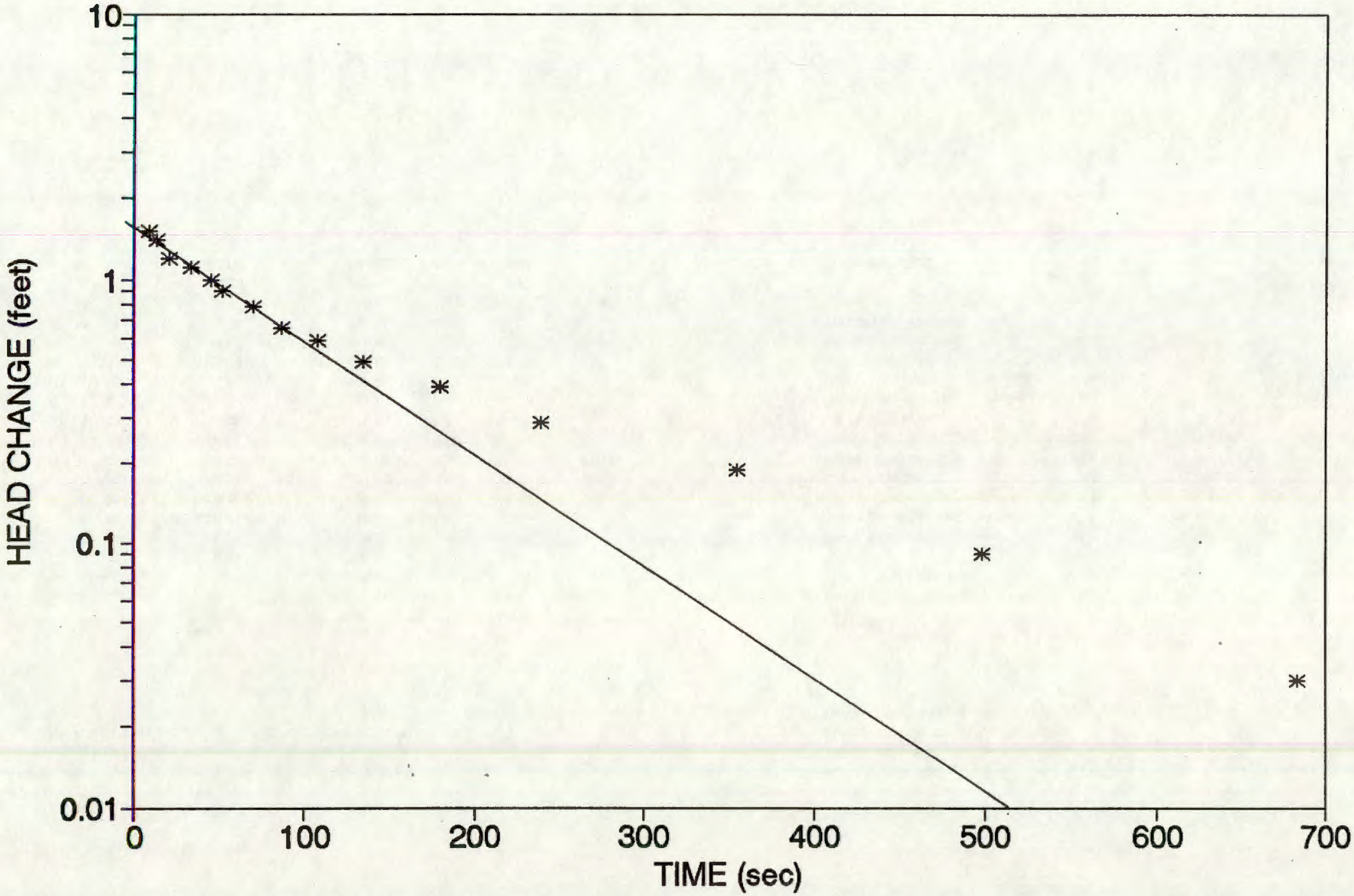
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	5.21		0.00	0.00	0.00
0	0	9	6.74		9.00	1.53	46.48
0	0	14	6.61		14.00	1.40	42.53
0	0	21	6.40		21.00	1.19	36.15
0	0	34	6.31		34.00	1.10	33.42
0	0	45	6.20		45.00	0.99	30.08
0	0	52	6.11		52.00	0.90	27.34
0	1	10	6.00		70.00	0.79	24.00
0	1	27	5.87		87.00	0.66	20.05
0	1	48	5.80		108.00	0.59	17.92
0	2	15	5.70		135.00	0.49	14.89
0	3	0	5.60		180.00	0.39	11.85
0	4	0	5.50		240.00	0.29	8.81
0	5	55	5.40		355.00	0.19	5.77
0	8	18	5.30		498.00	0.09	2.73
0	11	24	5.24		684.00	0.03	0.91
0	20	32	5.21		1232.00	0.00	0.00

Project: BAUSCH & LOMB FRAME CENTER
Project N 342.05
Well No.: BL-13S
Test Date: APRIL 20, 1994
Formation Tested: OVERBURDEN
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.7	82.30
Static water depth from stickup (ft)	5.21	158.80
Depth to bottom of screen from ground level (ft)	15.1	460.25
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	30	914.40
Delta H at Time 0 (ft)	1.53	46.63
Delta H at Time t (ft)	0.66	20.12
Time t (seconds)	87	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	5.2	2.4E-04
K, (Hvorslev Time Lag)	12.7	6.0E-04
K, (Hvorslev Variable Head)	12.6	5.9E-04

BAUSCH & LOMB FRAME CENTER
BL-13S RISING HEAD TEST



SLUG TEST DATA REDUCTION

Well: BL-13D
Date: APRIL 20, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 4.78
Initial Time (seconds): 0.00

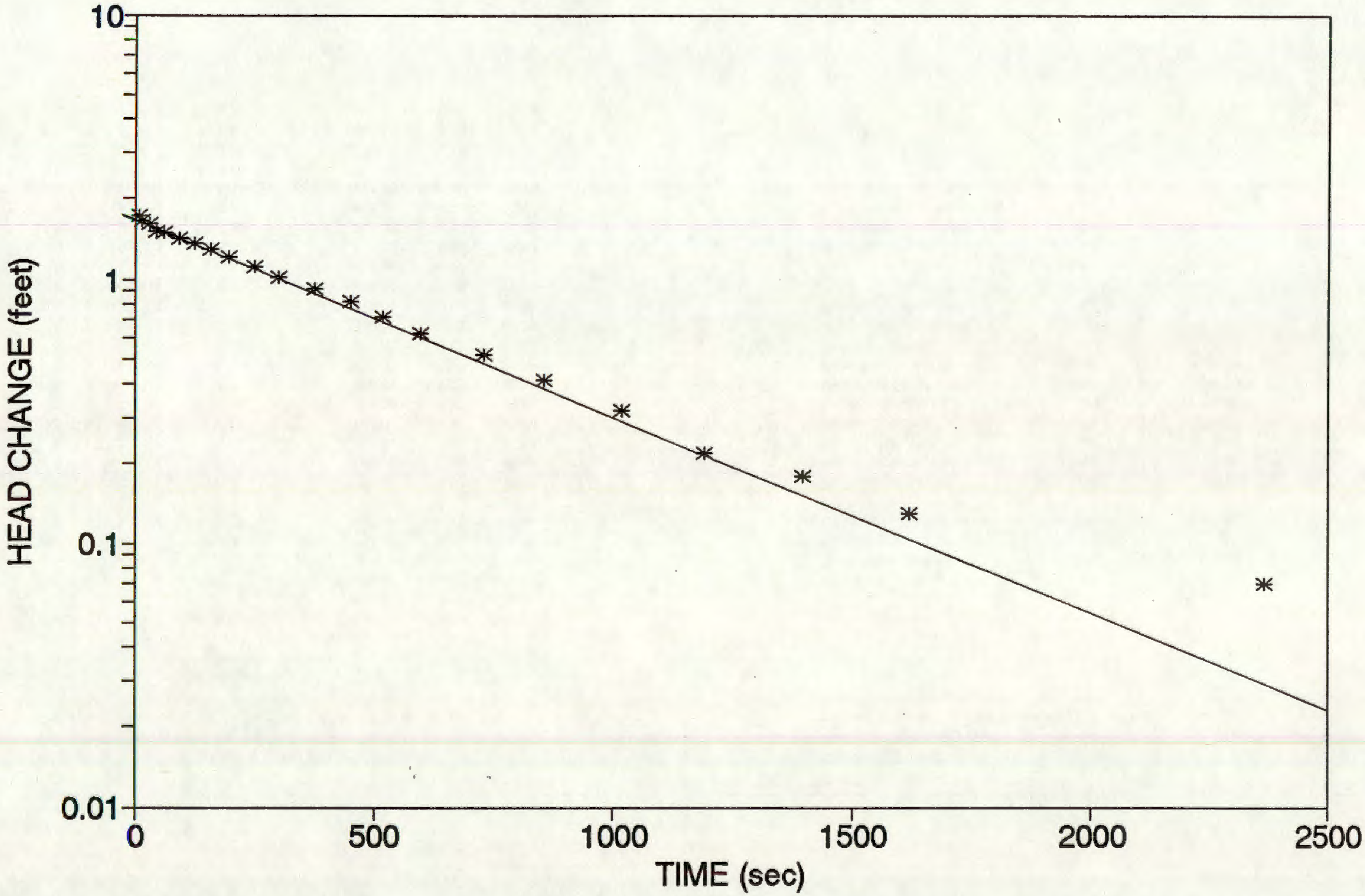
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	4.78		0.00	0.00	0.00
0	0	9	6.51		9.00	1.73	52.56
0	0	15	6.45		15.00	1.67	50.73
0	0	30	6.40		30.00	1.62	49.22
0	0	46	6.31		46.00	1.53	46.48
0	1	2	6.29		62.00	1.51	45.87
0	1	34	6.21		94.00	1.43	43.44
0	2	4	6.15		124.00	1.37	41.62
0	2	40	6.07		160.00	1.29	39.19
0	3	15	6.00		195.00	1.22	37.06
0	4	10	5.90		250.00	1.12	34.03
0	5	0	5.80		300.00	1.02	30.99
0	6	17	5.70		377.00	0.92	27.95
0	7	30	5.60		450.00	0.82	24.91
0	8	42	5.50		522.00	0.72	21.87
0	9	59	5.40		599.00	0.62	18.84
0	12	10	5.30		730.00	0.52	15.80
0	14	16	5.20		856.00	0.42	12.76
0	17	1	5.10		1021.00	0.32	9.72
0	19	53	5.00		1193.00	0.22	6.68
0	23	19	4.96		1399.00	0.18	5.47
0	27	0	4.91		1620.00	0.13	3.95
0	39	27	4.85		2367.00	0.07	2.13

Project: BAUSCH & LOMB FRAME CENTER
Project N 342.05
Well No.: BL-13D
Test Date: APRIL 20, 1994
Formation Tested: OVERBURDEN/TOP OF ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.8	85.34
Static water depth from stickup (ft)	4.78	145.69
Depth to bottom of screen from ground level (ft)	35.0	1066.80
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	1.67	50.90
Delta H at Time t (ft)	0.82	24.99
Time t (seconds)	450	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	1.0	4.9E-05
K, (Hvorslev Time Lag)	2.1	9.8E-05
K, (Hvorslev Variable Head)	2.1	9.7E-05

BAUSCH & LOMB FRAME CENTER
BL-13D RISING HEAD TEST



SLUG TEST DATA REDUCTION

Well: BL-14S
Date: APRIL 20, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 2.27
Initial Time (seconds): 0.00

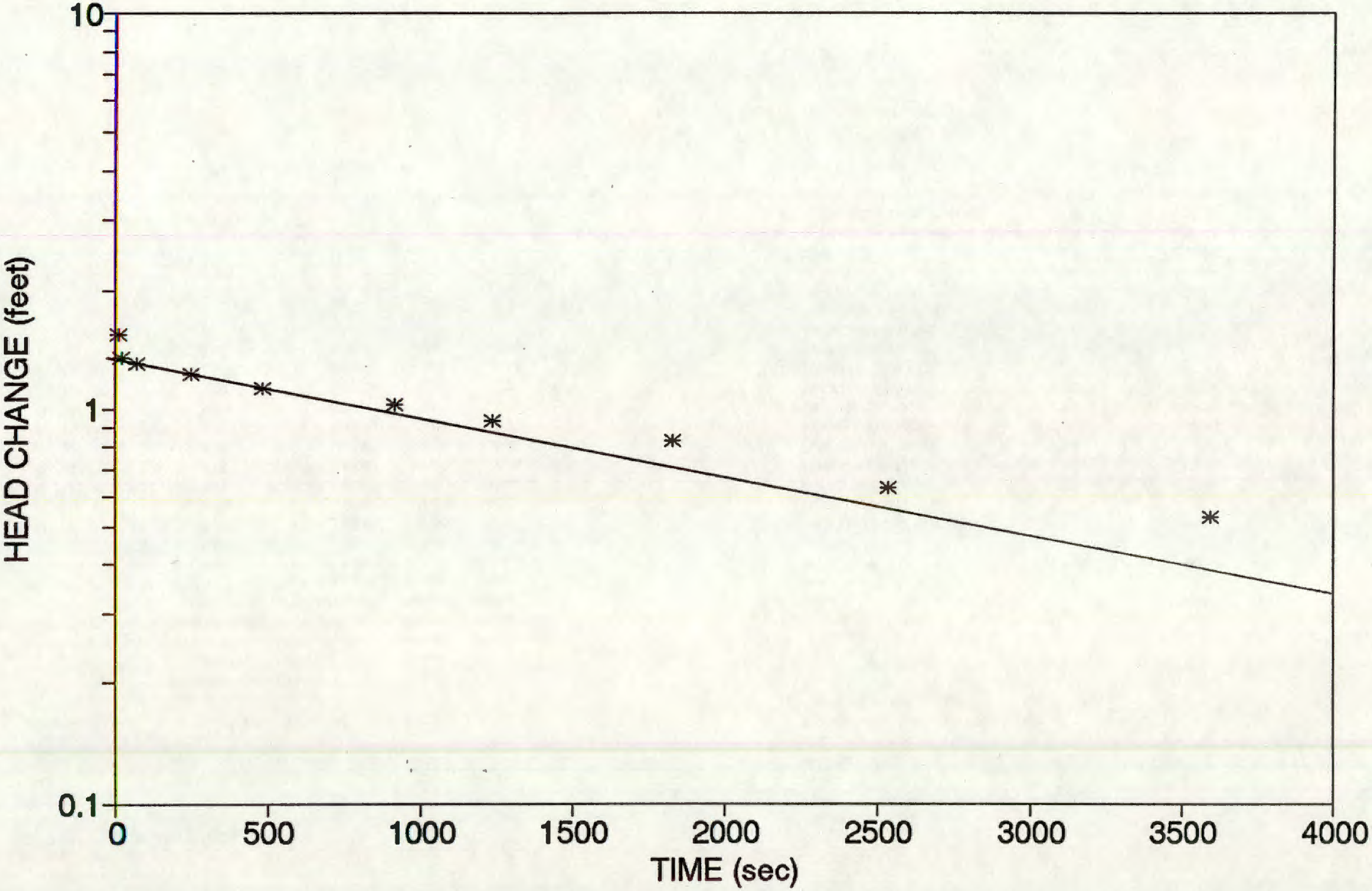
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	2.27		0.00	0.00	0.00
0	0	11	3.82		11.00	1.55	47.09
0	0	20	3.62		20.00	1.35	41.01
0	1	10	3.57		70.00	1.30	39.49
0	4	7	3.50		247.00	1.23	37.37
0	8	7	3.40		487.00	1.13	34.33
0	15	19	3.30		919.00	1.03	31.29
0	20	37	3.20		1237.00	0.93	28.25
0	30	30	3.10		1830.00	0.83	25.22
0	42	18	2.90		2538.00	0.63	19.14
1	0	0	2.80		3600.00	0.53	16.10

Project: BAUSCH & LOMB FRAME CENTER
Project N 342.05
Well No.: BL-14S
Test Date: APRIL 20, 1994
Formation Tested: OVERBURDEN
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.5	76.20
Static water depth from stickup (ft)	2.27	69.19
Depth to bottom of screen from ground level (ft)	24.0	731.52
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	8.00	243.84
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	1.55	47.24
Delta H at Time t (ft)	1.13	34.44
Time t (seconds)	487	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	0.5	2.1E-05
K, (Hvorslev Time Lag)	1.0	4.7E-05
K, (Hvorslev Variable Head)	1.0	4.7E-05

BAUSCH & LOMB FRAME CENTER
BL-14S RISING HEAD TEST



SLUG TEST DATA REDUCTION

Well: BL-14D
Date: APRIL 20, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 4.94
Initial Time (seconds): 0.00

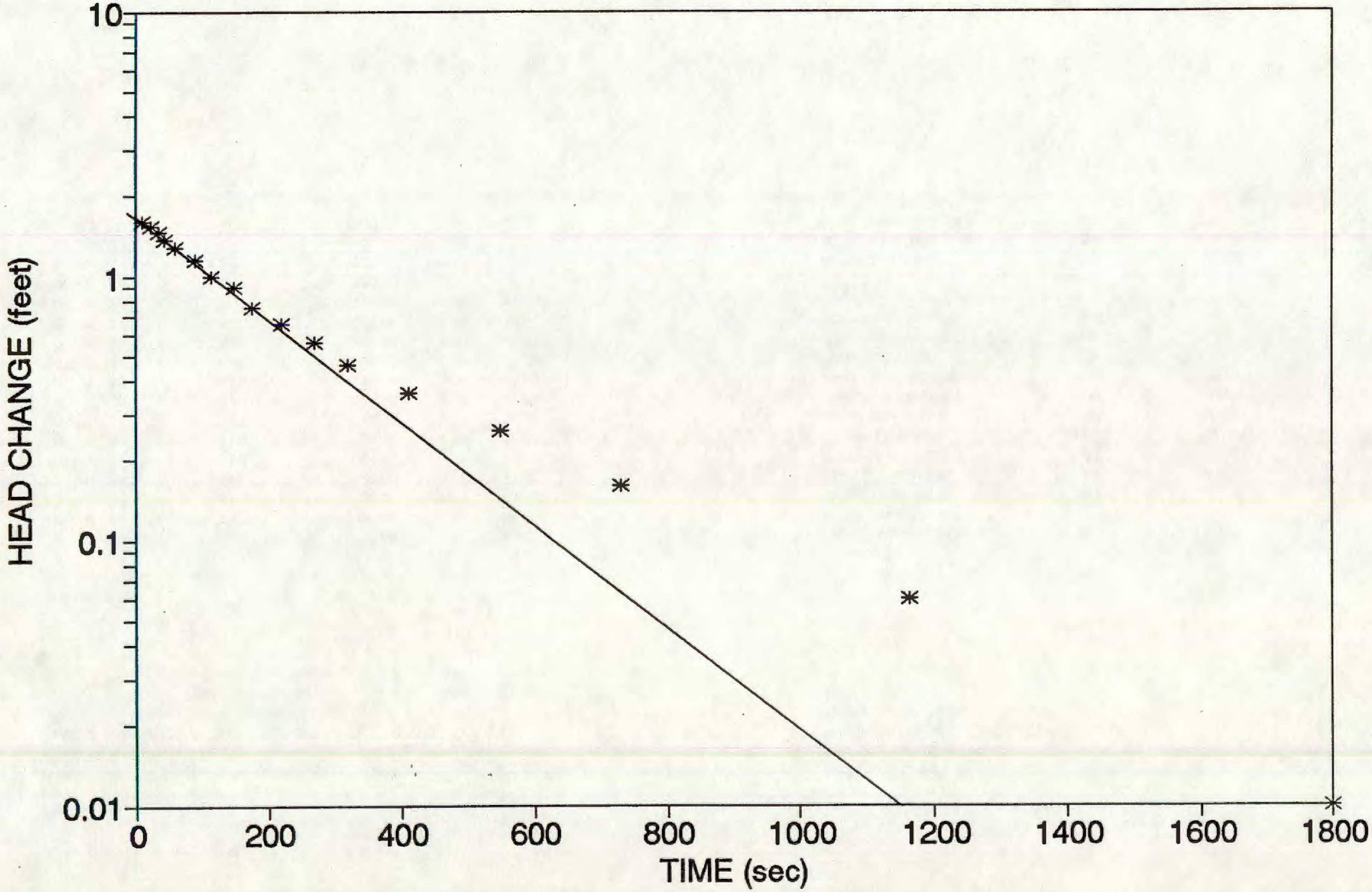
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	4.94		0.00	0.00	0.00
0	0	10	6.54		10.00	1.60	48.61
0	0	24	6.48		24.00	1.54	46.79
0	0	35	6.40		35.00	1.48	44.35
0	0	44	6.31		44.00	1.37	41.62
0	1	1	6.22		61.00	1.28	38.89
0	1	30	6.09		90.00	1.15	34.94
0	1	54	5.94		114.00	1.00	30.38
0	2	29	5.84		149.00	0.90	27.34
0	2	55	5.70		175.00	0.76	23.09
0	3	41	5.60		221.00	0.66	20.05
0	4	31	5.50		271.00	0.56	17.01
0	5	21	5.40		321.00	0.46	13.97
0	6	50	5.30		410.00	0.36	10.94
0	9	10	5.20		550.00	0.26	7.90
0	12	12	5.10		732.00	0.16	4.86
0	19	24	5.00		1164.00	0.06	1.82
0	30	0	4.95		1800.00	0.01	0.30

Project: BAUSCH & LOMB FRAME CENTER
Project N 342.05
Well No.: BL-14D
Test Date: APRIL 20, 1994
Formation Tested: OVERBURDEN/TOP OF ROCK
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.5	76.20
Static water depth from stickup (ft)	4.94	150.57
Depth to bottom of screen from ground level (ft)	39.6	1207.01
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	8.00	243.84
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	1.60	48.77
Delta H at Time t (ft)	0.76	23.16
Time t (seconds)	175	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	3.9	1.8E-04
K, (Hvorslev Time Lag)	6.5	3.1E-04
K, (Hvorslev Variable Head)	6.5	3.1E-04

BAUSCH & LOMB FRAME CENTER
BL-14D RISING HEAD TEST



SLUG TEST DATA REDUCTION

Well: BL-15D
Date: APRIL 20, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 1.84
Initial Time (seconds): 0.00

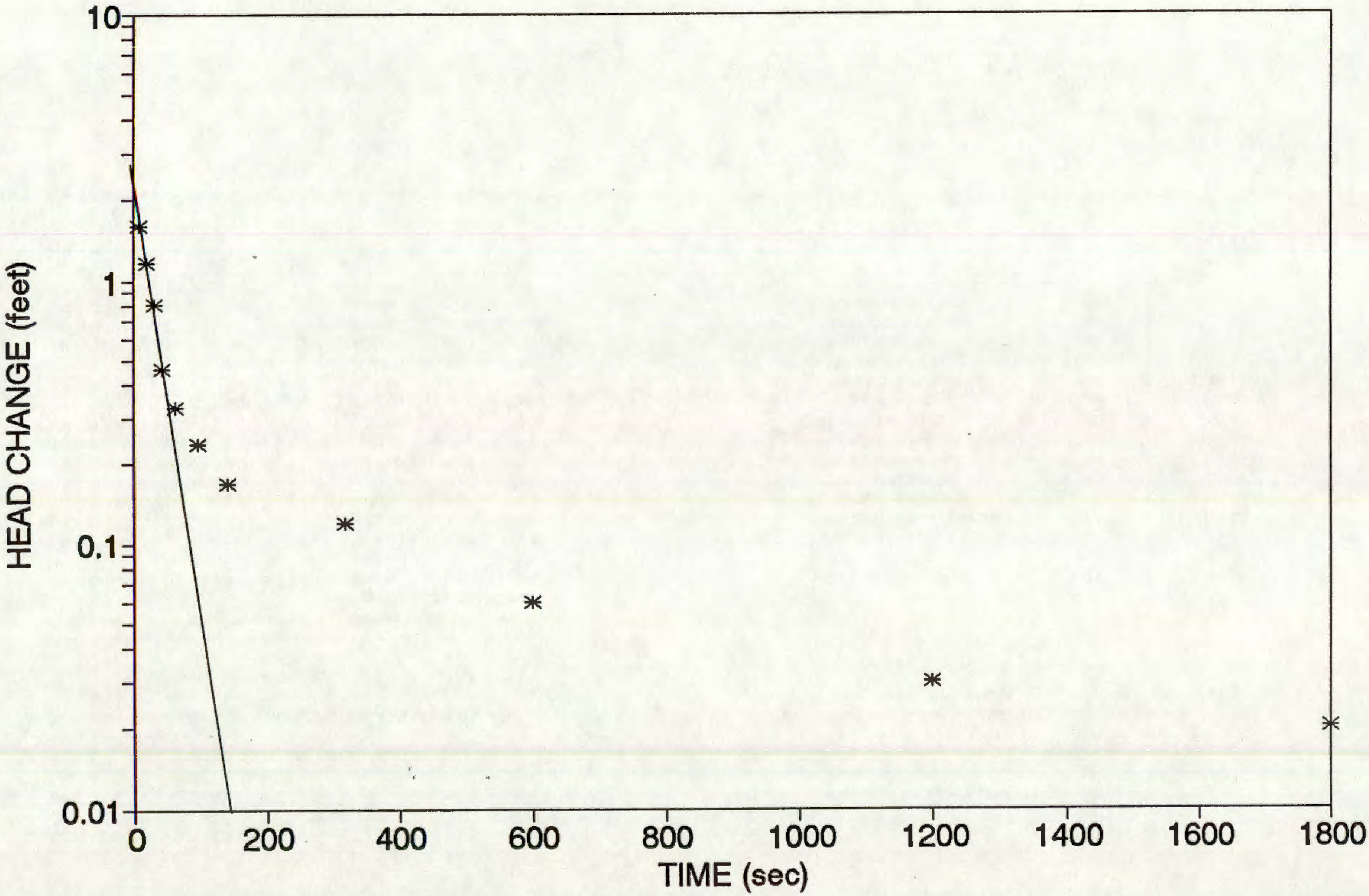
Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	1.84		0.00	0.00	0.00
0	0	9	3.44		9.00	1.60	48.61
0	0	20	3.00		20.00	1.16	35.24
0	0	30	2.65		30.00	0.81	24.61
0	0	42	2.30		42.00	0.46	13.97
0	1	2	2.17		62.00	0.33	10.03
0	1	37	2.08		97.00	0.24	7.29
0	2	21	2.01		141.00	0.17	5.16
0	5	17	1.96		317.00	0.12	3.65
0	10	0	1.90		600.00	0.06	1.82
0	20	0	1.87		1200.00	0.03	0.91
0	30	0	1.86		1800.00	0.02	0.61
0	40	0	1.84		2400.00	0.00	0.00

Project: BAUSCH & LOMB FRAME CENTER
Project N 342.05
Well No.: BL-15D
Test Date: APRIL 20, 1994
Formation Tested: OVERBURDEN/TOP OF ROCK
Rising (R) or Falling Head (F): R

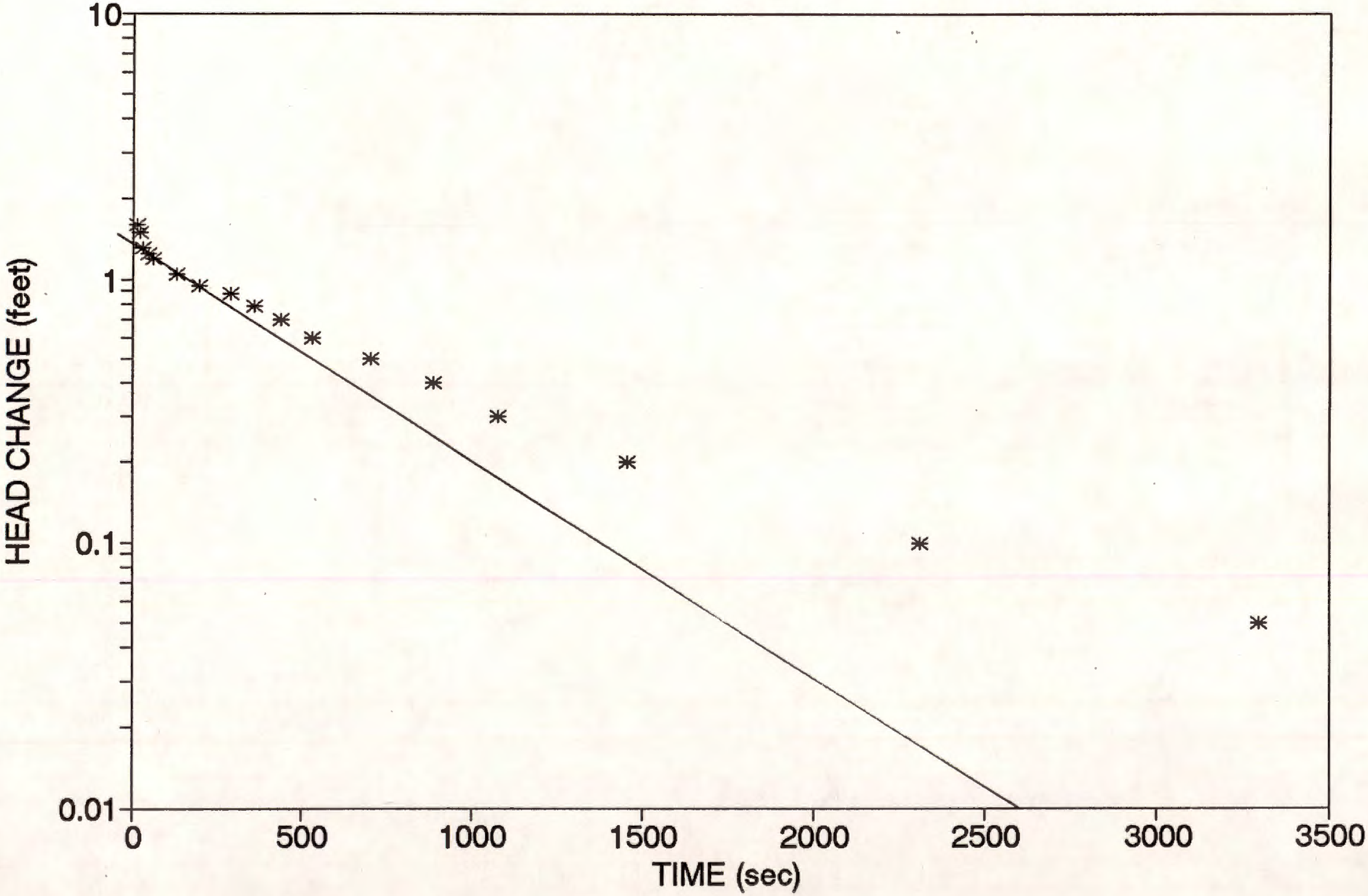
		(cm)
Reference Stickup (ft)	2.6	79.25
Static water depth from stickup (ft)	1.84	56.08
Depth to bottom of screen from ground level (ft)	37.6	1146.05
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	2.00	60.96
Delta H at Time t (ft)	0.33	10.06
Time t (seconds)	62	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	22.4	1.1E-03
K, (Hvorslev Time Lag)	38.2	1.8E-03
K, (Hvorslev Variable Head)	37.9	1.8E-03

BAUSCH & LOMB FRAME CENTER
BL-15D RISING HEAD TEST



BAUSCH & LOMB FRAME CENTER
BL-16S RISING HEAD TEST



SLUG TEST DATA REDUCTION

Well: BL-16S
Date: APRIL 20, 1994
Project: BAUSCH & LOMB FRAME CENTER
Rising (R) or Falling (F) Head: R
Bailer/Slug Dimensions: 1.25"x30" STAINLESS STEEL BAILER

Reference Depth (ft): 2.20
Initial Time (seconds): 0.00

Clock Time HR	MN	Sec	Depth to water FT	IN	Elapsed Time in Seconds	Head Change in feet	Head Change in cm.
0	0	0	2.20		0.00	0.00	0.00
0	0	10	3.81		10.00	1.61	48.91
0	0	18	3.70		18.00	1.50	45.57
0	0	29	3.51		29.00	1.31	39.80
0	0	47	3.44		47.00	1.24	37.67
0	1	0	3.39		60.00	1.19	36.15
0	2	10	3.25		130.00	1.05	31.90
0	3	15	3.14		195.00	0.94	28.56
0	4	50	3.08		290.00	0.88	26.73
0	5	57	2.99		357.00	0.79	24.00
0	7	19	2.90		439.00	0.70	21.27
0	8	51	2.80		531.00	0.60	18.23
0	11	42	2.70		702.00	0.50	15.19
0	14	47	2.60		887.00	0.40	12.15
0	18	0	2.50		1080.00	0.30	9.11
0	24	16	2.40		1456.00	0.20	6.08
0	38	30	2.30		2310.00	0.10	3.04
0	55	0	2.25		3300.00	0.05	1.52

Project: BAUSCH & LOMB FRAME CENTER
Project N 342.05
Well No.: BL-16S
Test Date: APRIL 20, 1994
Formation Tested: OVERBURDEN
Rising (R) or Falling Head (F): R

		(cm)
Reference Stickup (ft)	2.4	73.15
Static water depth from stickup (ft)	2.20	67.06
Depth to bottom of screen from ground level (ft)	14.1	429.77
Boring Diameter (in)	8.3	20.96
Riser Diameter (in)	2.0	5.08
Screen Diameter (in)	2.0	5.08
Screen Length (ft)	9.70	295.66
Depth to Boundary	40	1219.20
Delta H at Time 0 (ft)	1.31	39.93
Delta H at Time t (ft)	0.94	28.65
Time t (seconds)	195	
Assumed Kh/Kv Ratio	100	
Porosity of Filter Pack	0.3	

	gpd/ft2	cm/sec
K, (Bouwer-Rice)	0.9	4.3E-05
K, (Hvorslev Time Lag)	2.2	1.1E-04
K, (Hvorslev Variable Head)	2.2	1.0E-04

APPENDIX E

Chemical Analytical Summary Tables

TABLE E-4
BAUSCH & LOMB
FRAME CENTER SITE
CHILI, NEW YORK

GROUND WATER SAMPLE ANALYTICAL SUMMARY
VOLATILE ORGANIC COMPOUNDS
APRIL 1994

	SAMPLE																
	BL-9S	BL-9D	BL-10S	BL-10D	BL-11S	BL-11D	BL-12S	BL-13S	BL-13D	BL-14S	BL-14D	BL-15D	BL-16S	EQUIP. BLANK I	EQUIP. BLANK II	QC TRIP BLANK	QC TRIP BLANK
	DATE																
COMPOUND	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/11/94	4/12/94	4/12/94	4/12/94	4/12/94	4/12/94	4/12/94	4/11/94	4/12/94	4/11/94	4/12/94
BENZENE	<100	<1	<10	<1	<1	<100	**2**	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
BENZYL CHLORIDE	<1000 R	<10 R	<100 R	<10 R	<10 R	<1000 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10000 R	<10 R	<10 R	<10 R	<10 R
BIS(2-CHLOROETHOXY)METHANE	<50000 R	<500 R	<5000 R	<500 R	<500 R	<50000 R	<500 R	<500 R	<500 R	<500 R	<500 R	<500 R	<500000 R	<500 R	<500 R	<500 R	<500 R
BROMOBENZENE	<500 R	<5 R	<50 R	<5 R	<5 R	<500 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5000 R	<5 R	<5 R	<5 R	<5 R
BROMODICHLOROMETHANE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
BROMOFORM	<1000	<10	<100	<10	<10	<1000	<10	<10	<10	<10	<10	<10	<10000	<10	<10	<10	<10
BROMOMETHANE	<1000	<10	<100	<10	<10	<1000	<10	<10	<10	<10	<10	<10	<10000	<10	<10	<10	<10
CARBON TETRACHLORIDE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
CHLOROBENZENE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
CHLOROETHANE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
2-CHLOROETHYLVINYL ETHER	<2000	ND	<200	ND	ND	ND	ND	<20	<20	<20	<20	<20	<20000	ND	<20	ND	<20
CHLOROFORM	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
1-CHLOROHEXANE	<1000 R	<10 R	<100 R	<10 R	<10 R	<1000 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10000 R	<10 R	<10 R	<10 R	<10 R
CHLOROMETHANE	<1000	<10	<100	<10	<10	<1000	<10	<10	<10	<10	<10	<10	<10000	<10	<10	<10	<10
CHLOROMETHYLMETHYL ETHER	<10000 R	<100 R	<1000 R	<100 R	<100 R	<10000 R	<100 R	<100 R	<100 R	<100 R	<100 R	<100 R	<100000 R	<100 R	<100 R	<100 R	<100 R
2-CHLOROTOLUENE	<500 R	<5 R	<50 R	<5 R	<5 R	<500 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5000 R	<5 R	<5 R	<5 R	<5 R
4-CHLOROTOLUENE	<500 R	<5 R	<50 R	<5 R	<5 R	<500 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5000 R	<5 R	<5 R	<5 R	<5 R
DIBROMOCHLOROMETHANE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
DIBROMOMETHANE	<1000 R	<10 R	<100 R	<10 R	<10 R	<1000 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10000 R	<10 R	<10 R	<10 R	<10 R
1,2-DICHLOROBENZENE	<500	<5	<50	<5	<5	<500	<5	<5	<5	<5	<5	<5	<5000	<5	<5	<5	<5
1,3-DICHLOROBENZENE	<500	<5	<50	<5	<5	<500	<5	<5	<5	<5	<5	<5	<5000	<5	<5	<5	<5
1,4-DICHLOROBENZENE	<500	<5	<50	<5	<5	<500	<5	<5	<5	<5	<5	<5	<5000	<5	<5	<5	<5
DICHLORODIFLUOROMETHANE	#	<10	<100	<10	<10	<1000	<10	#	<10	<10	<10	<10	<10000	<10	<10	<10	<10
1,1-DICHLOROETHANE	<100	<1	<10	<1	<1	<100	**1**	<1	<1	**1**	<1	<1	<1000	<1	<1	<1	<1
1,2-DICHLOROETHANE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
1,1-DICHLOROETHYLENE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
1,2-DICHLOROETHYLENE (TOTAL)	**1700**	<1	<10	<1	**1**	**1200**	<1	<1	**1**	<1	<1	<1	<1000	<1	<1	<1	<1
DICHLOROMETHANE	<100	<1	<10	<1	<1	**100**	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
1,2-DICHLOROPROPANE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
CIS-1,3-DICHLOROPROPYLENE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
TRANS-1,3-DICHLOROPROPYLENE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
ETHYLBENZENE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
1,1,2,2-TETRACHLOROETHANE	<100	<1	<200	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
1,1,1,2-TETRACHLOROETHANE	<100 R	<1 R	<10 R	<1 R	<1 R	<100 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1000 R	<1 R	<1 R	<1 R	<1 R
TETRACHLOROETHYLENE	<100	<1	**460**	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
TOLUENE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
1,1,1-TRICHLOROETHANE	<100	<1	<10	<1	<1	**2800**	**3**	<1	<1	**2**	<1	<1	**11000**	<1	<1	<1	<1
1,1,2-TRICHLOROETHANE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
TRICHLOROETHYLENE	<100	<1	<10	<1	**1**	**8100**	**1**	<1	<1	**1**	<1	<1	**62000**	<1	<1	<1	<1
TRICHLOROFLUOROMETHANE	<100	<1	<10	<1	<1	<100	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1
1,2,3-TRICHLOROPROPANE	<100 R	<1 R	<10 R	<1 R	<1 R	<100 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1000 R	<1 R	<1 R	<1 R	<1 R
VINYL CHLORIDE	**710#**	<1	<10	<1	<1	<100	<1	**2#**	<1	<1	<1	<1	<1000	<1	<1	<1	<1
XYLENE (TOTAL)	<300	<3	<30	<3	<3	<3000	<3	<3	<3	<3	<3	<3	<3000	<3	<3	<3	<3
FREON 113	<100	<1	<10	<1	<1	**1100**	<1	<1	<1	<1	<1	<1	<1000	<1	<1	<1	<1

Notes:

All concentrations reported in ug/L.
< – Less than.
#= The value reported for vinyl chloride may represent vinyl chloride , dichlorodifluoromethane, or any combination of the two compounds.
* – Duplicate sample.
ND – Not determined.
R – Analysis for this compound rejected during data validation.
Shaded/bolded values designate that concentration exceeded detection limit.

TABLE E-4
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

GROUND WATER SAMPLE ANALYTICAL SUMMARY
VOLATILE ORGANIC COMPOUNDS
APRIL 1994

COMPOUND	BL-1 4/12/94	BL-2S 4/11/94	BL-2D 4/11/94	BL-3 4/11/94	BL-4S 4/11/94	SAMPLE BL-4D DATE 4/11/94	BL-5S 4/11/94	BL-5D 4/11/94	BL-5D* 4/11/94	BL-6S 4/11/94	BL-6S* 4/11/94	BL-6D 4/11/94	BL-7 4/12/94	BL-8r 4/12/94
BENZENE	<1	<1	1	<1	<1	<1	<1	<1	<1	<10	<10	<1	81	<1
BENZYL CHLORIDE	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<100 R	<100 R	<10 R	<100 R	<10 R
BIS(2-CHLOROETHOXY)METHANE	<500 R	<500 R	<500 R	<500 R	<500 R	<500 R	<500 R	<500 R	<500 R	<5000 R	<5000 R	<500 R	<5000 R	<500 R
BROMOBENZENE	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<50 R	<50 R	<5 R	<50 R	<5 R
BROMODICHLOROMETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
BROMOFORM	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100	<100	<10	<100	<10
BROMOMETHANE	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100	<100	<10	<100	<10
CARBON TETRACHLORIDE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
CHLOROBENZENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
CHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
2-CHLOROETHYLVINYL ETHER	<20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<200	<20
CHLOROFORM	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1-CHLOROHEXANE	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<100 R	<100 R	<10 R	<100 R	<10 R
CHLOROMETHANE	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100	<100	<10	<100	<10
CHLOROMETHYLMETHYL ETHER	<100 R	<100 R	<100 R	<100 R	<100 R	<100 R	<100 R	<100 R	<100 R	<1000 R	<1000 R	<100 R	<1000 R	<100 R
2-CHLOROTOLUENE	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<50 R	<50 R	<5 R	<50 R	<5 R
4-CHLOROTOLUENE	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<5 R	<50 R	<50 R	<5 R	<50 R	<5 R
DIBROMOCHLOROMETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
DIBROMOMETHANE	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<10 R	<100 R	<100 R	<10 R	<100 R	<10 R
1,2-DICHLOROBENZENE	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<5	<50	<5
1,3-DICHLOROBENZENE	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<5	<50	<5
1,4-DICHLOROBENZENE	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<50	<5	<50	<5
DICHLORODIFLUOROMETHANE	<10	<10	<10	<10	<10	<10	<10	<10	<10	<100	<100	<10	<100	<10
1,1-DICHLOROETHANE	<1	<1	2	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,2-DICHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,1-DICHLOROETHYLENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,2-DICHLOROETHYLENE (TOTAL)	<1	<1	2	<1	<1	<1	<1	<1	<1	36	34	<1	<10	<1
DICHLOROMETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,2-DICHLOROPROPANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
CIS-1,3-DICHLOROPROPYLENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
TRANS-1,3-DICHLOROPROPYLENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
ETHYLBENZENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,1,2,2-TETRACHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,1,1,2-TETRACHLOROETHANE	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<10 R	<10 R	<1 R	<10 R	<1 R
TETRACHLOROETHYLENE	1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
TOLUENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,1,1-TRICHLOROETHANE	<1	<1	1	7	<1	<1	<1	<1	<1	<10	<10	<1	54	<1
1,1,2-TRICHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
TRICHLOROETHYLENE	<1	<1	34	<1	23	<1	<1	<1	<1	420	380	<1	94	<1
TRICHLOROFLUOROMETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
1,2,3-TRICHLOROPROPANE	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<10 R	<10 R	<1 R	<10 R	<1 R
VINYL CHLORIDE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1
XYLENE (TOTAL)	<3	<3	<3	<3	<3	<3	<3	<3	<3	<30	<30	<3	<30	<3
FREON 113	<1	2	57	<1	28	<1	<1	1	<1	38	34	<1	490	<1

Notes: See page 2 of 2

TABLE E-3
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

TOPSOIL PILE SAMPLING AREA
SAMPLE ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
MARCH 1994

	SAMPLE																		
	P1-1	P1-1*	P1-2	P1-4	P1-5	P1-7	P1-8	P1-10	P1-11	P2-1	P2-2	P2-4	P2-5	P2-7	P2-8	P2-10	P2-11	EQUIP. BLANK	QC TRIP BLANK
COMPOUND	DATE																		
	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94	3/31/94
BENZENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BENZYL CHLORIDE	<12 R	<13 R	<13 R	<13 R	<12 R	<12 R	<12 R	<12 R	<12 R	<13 R	<13 R	<12 R	<12 R	<12 R	<12 R	<13 R	<13 R	<10 R	<10 R
BIS(2-CHLOROETHOXY)METHANE	<580 R	<640 R	<630 R	<670 R	<620 R	<600	<620 R	<580 R	<610 R	<640 R	<650 R	<610 R	<620 R	<620 R	<620 R	<640 R	<640 R	<500 R	<500 R
BROMOBENZENE	<6 R	<6 R	<6 R	<7 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<5 R	<5 R
BROMODICHLOROMETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BROMOFORM	<12	<13	<13	<13	<12	<12	<12	<12	<12	<13	<13	<12	<12	<12	<12	<13	<13	<10	<10
BROMOMETHANE	<12	<13	<13	<13	<12	<12	<12	<12	<12	<13	<13	<12	<12	<12	<12	<13	<13	<10	<10
CARBON TETRACHLORIDE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CHLOROBENZENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-CHLOROETHYLVINYL ETHER	<12	<13	<13	<13	<12	<12	<12	<12	<12	<13	<13	<12	<12	<25	<25	<26	<25	<10	<10
CHLOROFORM	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	8	<1
1-CHLOROHEXANE	<12 R	<13 R	<13 R	<13 R	<12 R	<12 R	<12 R	<12 R	<12 R	<13 R	<13 R	<12 R	<12 R	<12 R	<12 R	<13 R	<13 R	<10 R	<10 R
CHLOROMETHANE	<12	<13	<13	<13	<12	<12	<12	<12	<12	<13	<13	<12	<12	<12	<12	<13	<13	<10	<10
CHLOROMETHYLMETHYL ETHER	<120 R	<130 R	<130 R	<130 R	<120 R	<120 R	<120 R	<120 R	<120 R	<130 R	<130 R	<120 R	<120 R	<120 R	<120 R	<130 R	<130 R	<100 R	<100 R
2-CHLOROTOLUENE	<6 R	<6 R	<6 R	<7 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<5 R	<5 R
4-CHLOROTOLUENE	<6 R	<6 R	<6 R	<7 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<6 R	<5 R	<5 R
DIBROMOCHLOROMETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
DIBROMOMETHANE	<12 R	<13 R	<13 R	<13 R	<12 R	<12 R	<12 R	<12 R	<12 R	<13 R	<13 R	<12 R	<12 R	<12 R	<12 R	<13 R	<13 R	<10 R	<10 R
1,2-DICHLOROBENZENE	<6	<6	<6	<7	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<5	<5
1,3-DICHLOROBENZENE	<6	<6	<6	<7	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<5	<5
1,4-DICHLOROBENZENE	<6	<6	<6	<7	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<5	<5
DICHLORODIFLUOROMETHANE	<12	<13	<13	<13	<12	<12	<12	<12	<12	<13	<13	<12	<12	<12	<12	<13	<13	<10	<10
1,1-DICHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-DICHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-DICHLOROETHYLENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-DICHLOROETHYLENE (TOTAL)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
DICHLOROMETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	1	2	<1	<1	<1
1,2-DICHLOROPROPANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CIS-1,3-DICHLOROPROPYLENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRANS-1,3-DICHLOROPROPYLENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ETHYLBENZENE	<1	<1	<1	<1	<1	<1 V	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-TETRACHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1,2-TETRACHLOROETHANE	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R
TETRACHLOROETHYLENE	<1	<1	<1	<1	<1	<1 V	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TOLUENE	<1	<1	<1	<1	<1	<1 V	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-TRICHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-TRICHLOROETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRICHLOROETHYLENE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRICHLOROFLUOROMETHANE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,3-TRICHLOROPROPANE	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R	<1 R
VINYL CHLORIDE	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
XYLENE (TOTAL)	<4	<4	<4	<4	<4	<4 V	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<3	<3
FREON 113	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes:

All concentrations reported in ug/kg except equipment blank and QC blank which are reported in ug/L.
< – Less than.
* – Duplicate sample.
R – Analysis for this compound rejected during data validation.
V – Indicates that value is estimated.
Shaded/bolded values designate that concentration exceeded detection limit.

TABLE E-2
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SOIL BORING SAMPLE ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
MARCH 1994

SAMPLE DEPTH DATE	B-4 (10-12) 3/21/94	B-4 (12-14) 3/21/94	BL-13S (10-12) 3/21/94	BL-13D (26-28) 3/18/94	BL-14S (18-20) 3/23/94	BL-14D (34-36) 3/22/94	BL-15D (30-32) 3/17/94	BL-15D* (30-32) 3/17/94	EQUIP. BLANK 3/17/94	QC BLANK 3/17/94	QC BLANK 3/18/94	QC BLANK 3/21/94	QC BLANK 3/23/94
BENZENE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BENZYL CHLORIDE	<76	<72	<14	<15	<14	<14	<17	<14	<13	<13	<13	<13	<13
BIS(2-CHLOROETHOXY)METHANE	<17000	<1600	<2100	<2200	<3200	<3100	<2400	<2100	<1900	<2900	<1900	<1900	<1900
BROMOBENZENE	<82	<76	<15	<16	<16	<15	<18	<15	<14	<14	<14	<14	<14
BROMODICHLOROMETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BROMOFORM	<58	<58	<11	<11	<11	<11	<11	<11	<10	<10	<10	<10	<10
BROMOMETHANE	<58	<56	<11	<11	<11	<11	<11	<11	<10	<10	<10	<10	<10
CARBON TETRACHLORIDE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CHLOROBENZENE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CHLOROETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-CHLOROETHYLVINYL ETHER	<58	<58	<11	<11	<11	<11	<11	<11	<10	<10	<10	<10	<10
CHLOROFORM	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1-CHLOROHEXANE	<58	<58	<11	<11	<11	<11	<11	<11	<10	<10	<10	<10	<10
CHLOROMETHANE	<58	<158	<11	<11	<11	<11	<11	<11	<10	<10	<10	<10	<10
CHLOROMETHYLMETHYL ETHER	<580	<560	<110	<110	<110	<110	<110	<110	<100	<100	<100	<100	<100
2-CHLOROTOLUENE	<70	<67	<13	<14	<13	<13	<15	<13	<12	<12	<12	<12	<12
4-CHLOROTOLUENE	<70	<67	<13	<14	<13	<13	<15	<13	<12	<12	<12	<12	<12
DIBROMOCHLOROMETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
DIBROMOMETHANE	<76	<72	<14	<15	<14	<14	<17	<14	<13	<13	<13	<13	<13
1,2-DICHLOROBENZENE	<29	<28	<6	<6	<6	<5	<5	<5	<5	<5	<5	<5	<5
1,3-DICHLOROBENZENE	<29	<28	<6	<6	<6	<5	<5	<5	<5	<5	<5	<5	<5
1,4-DICHLOROBENZENE	<29	<28	<6	<6	<6	<5	<5	<5	<5	<5	<5	<5	<5
DICHLORODIFLUOROMETHANE	<58	<56	<11	<11	<11	<11	<11	<11	<10	<10	<10	<10	<10
1,1-DICHLOROETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-DICHLOROETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-DICHLOROETHYLENE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-DICHLOROETHYLENE (TOTAL)	<6	<6	<1	**4**	<1	<1	<1	<1	<1	<1	<1	<1	<1
DICHLOROMETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-DICHLOROPROPANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CIS-1,3-DICHLOROPROPYLENE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRANS-1,3-DICHLOROPROPYLENE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
ETHYLBENZENE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-TETRACHLOROETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1,2-TETRACHLOROETHANE	<64	<61	<12	<13	<12	<12	<14	<12	<11	<11	<11	<11	<11
TETRACHLOROETHYLENE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TOLUENE	<6	<6	<1	**1**	<1	<1	**2**	**4**	<1	<1	<1	<1	<1
1,1,1-TRICHLOROETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-TRICHLOROETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRICHLOROETHYLENE	**82**	**82**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRICHLOROFLUOROMETHANE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,3-TRICHLOROPROPANE	<82	<78	<15	<16	<16	<15	<16	<15	<14	<14	<14	<14	<14
VINYL CHLORIDE	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
XYLENE (TOTAL)	<18	<17	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
FREON 113	<6	<6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes:

All concentrations reported in ug/kg.
< - Less than.
(10-12) - Indicates depth in feet below ground surface.
R - Analysis for this compound rejected during data validation.
* - Duplicate sample.
Shaded/bolded values designate that concentration exceeded detection limit.

TABLE E-1
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SHALLOW SOIL SAMPLING AREA
SAMPLE ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
FEBRUARY AND MARCH 1994

COMPOUND	SAMPLE DATE													
	-125,125 3/11/94	-125,150 3/11/94	-125,175 3/11/94	-125,200 3/11/94	-125,225 3/11/94	-150,150 3/11/94	-150,175 3/11/94	-150,200 3/11/94	-150,225 3/11/94	EQUIP. BLANK 2/28/94	EQUIP. BLANK 2/28/94	EQUIP. BLANK 3/11/94	QC BLANK 2/28/94	QC BLANK 3/11/94
BENZENE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
BENZYL CHLORIDE	<15 R	<15 R	<16 R	<13 R	<14 R	<13 R	<14 R	<14 R	<18 R	<13	<13	<10 R	<13	<10
BIS(2-CHLOROETHOXY)METHANE	<760 R	<740 R	<780 R	<660 R	<700 R	<670 R	<680 R	<710 R	<790 R	<1900	<1900	<500R	<1900	<500 R
BROMOBENZENE	<8 R	<7 R	<8 R	<7 R	<7 R	<7 R	<7 R	<7 R	<8 R	<14	<14	<5 R	<14	<5 R
BROMODICHLOROMETHANE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1 R
BROMOFORM	<15	<15	<16	<13 V	<14	<13 V	<14	<14	<18	<10	<10	<10	<10	<10
BROMOMETHANE	<15	<15	<16	<13 V	<14	<13 V	<14	<14	<18	<10	<10	<10	<10	<10
CARBON TETRACHLORIDE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
CHLOROBENZENE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
CHLOROETHANE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
2-CHLOROETHYLVINYL ETHER	<15	<15	<16	<13 V	<14	<13 V	<14	<14	<18	<10	<10	<10	<10	<10
CHLOROFORM	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
1-CHLOROHEXANE	<15 R	<15 R	<16 R	<13 R	<14 R	<13 R	<14 R	<14 R	<18 R	<10	<10	<10 R	<10	<10 R
CHLOROMETHANE	<15	<15	<16	<13 V	<14	<13 V	<14	<14	<16	<10	<10	<10	<10	<10
CHLOROMETHYLMETHYL ETHER	<150 R	<150 R	<160 R	<130 R	<140 R	<130 R	<140 R	<140 R	<160 R	<100	<100	<100 R	<100	<100 R
2-CHLOROTOLUENE	<8 R	<7 R	<8 R	<7 R	<7 R	<7 R	<7 R	<7 R	<8 R	<12	<12	<5 R	<12	<5 R
4-CHLOROTOLUENE	<8 R	<7 R	<8 R	<7 R	<7 R	<7 R	<7 R	<7 R	<8 R	<12	<12	<5 R	<12	<5 R
DIBROMOCHLOROMETHANE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
DIBROMOMETHANE	<15 R	<15 R	<16 R	<13 R	<14 R	<13 R	<14 R	<14 R	<16 R	<13	<13	<10 R	<13	<10 R
1,2-DICHLOROBENZENE	<8	<7	<8	<7 V	<7	<7 V	<7	<7	<8	<5	<5	<5	<5	<5
1,3-DICHLOROBENZENE	<8	<7	<8	<7 V	<7	<7 V	<7	<7	<8	<5	<5	<5	<5	<5
1,4-DICHLOROBENZENE	<8	<7	<8	<7 V	<7	<7 V	<7	<7	<8	<5	<5	<5	<5	<5
DICHLORODIFLUOROMETHANE	<15	<15	<16	<13 V	<14	<13 V	<14	<14	<16	<10	<10	<10	<10	<10
1,1-DICHLOROETHANE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
1,2-DICHLOROETHANE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
1,1-DICHLOROETHYLENE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
1,2-DICHLOROETHYLENE (TOTAL)	<2	<1	<2	<1 V	**3**	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
DICHLOROMETHANE	<2	<1	<2	<1 V	<1	<1 V	**1**	**3**	<2	<1	<1	<1	<1	<1
1,2-DICHLOROPROPANE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
CIS-1,3-DICHLOROPROPYLENE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
TRANS-1,3-DICHLOROPROPYLENE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
ETHYLBENZENE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
1,1,2,2-TETRACHLOROETHANE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
1,1,1,2-TETRACHLOROETHANE	<2 R	<1 R	<2 R	<1 R	<1 R	<1 R	<1 R	<1 R	<2 R	<11	<11	<1 R	<11	<1 R
TETRACHLOROETHYLENE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
TOLUENE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
1,1,1-TRICHLOROETHANE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
1,1,2-TRICHLOROETHANE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
TRICHLOROETHYLENE	<2	<1	<2	**7 V**	**7**	< 1 V	<1	**4**	<2	<1	<1	<1	<1	<1
TRICHLOROFLUOROMETHANE	<2	<1	<2	**12 V**	<1	**16 V**	**11**	<1	<2	<1	<1	<1	<1	<1
1,2,3-TRICHLOROPROPANE	<2 R	<1 R	<2 R	<1 R	<1 R	<1 R	<1 R	<1 R	<2 R	<14	<14	<1 R	<14	<1 R
VINYL CHLORIDE	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1	<1	<1	<1	<1
XYLENE (TOTAL)	<5	<4	<5	<4 V	<4	<4 V	<4	<4	<5	<3	<3	<3	<3	<3
FREON 113	<2	<1	<2	<1 V	<1	<1 V	<1	<1	<2	<1 V	<1 V	<1	<1 V	<1

Notes:
All concentrations reported in ug/kg.
< – Less than.
* – Duplicate sample.
# – The value reported for 1,1,2–Trichloroethane may represent 1,1,2– Trichloroethane, Dibromochloromethane, trans–1,3–Dichloropropylene or any combination of the three compounds.
R – Analysis for this compound rejected during data validation.
V – Indicates that value is estimated.
Shaded/bolded values designate that concentration exceeded detection limit.

TABLE E-1
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SHALLOW SOIL SAMPLING AREA
SAMPLE ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
FEBRUARY AND MARCH 1994

	SAMPLE													
	-75,25	-75,50	-75,50*	-75,100	-75,150	-75,175	-75,225	-100,0	-100,25	-100,75	-100,125	-100,150	-100,175	-100,200
	DATE													
COMPOUND	2/28/94	2/28/94	2/28/94	2/28/94	2/28/94	2/28/94	3/11/94	2/28/94	2/28/94	2/28/94	2/28/94	2/28/94	2/28/94	2/28/94
BENZENE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
BENZYL CHLORIDE	<23	<18	<17	<18	<20	<20	<15 R	<14 R	<14 R	<14 R	<14 R	<16 R	<70 R	<18 R
BIS(2-CHLOROETHOXY)METHANE	<3300	<2600	<2400	<2600	<3000	<2900	<750 R	<710 R	<710 R	<710 R	<720 R	<800 R	<3500 R	<820 R
BROMOBENZENE	<24	<19	<18	<19	<22	<21	<7 R	<7 R	<7 R	<7 R	<7 R	<8 R	<35 R	<8 R
BROMODICHLOROMETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
BROMOFORM	<17	<14	<13	<14	<16	<15	<15	<14	<14	<14	<14	<16	<70	<16
BROMOMETHANE	<17	<14	<13	<14	<16	<15	<15	<14	<14	<14	<14	<16	<70	<16
CARBON TETRACHLORIDE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
CHLOROBENZENE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
CHLOROETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
2-CHLOROETHYLVINYL ETHER	<17	<14	<13	<14	<18	<15	<15	<14	<14	<14	<14	<16	<70	<16
CHLOROFORM	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1-CHLOROHEXANE	<17	<14	<13	<14	<16	<15	<15 R	<14 R	<14 R	<14 R	<14 R	<16 R	<70 R	<18 R
CHLOROMETHANE	<17	<14	<13	<14	<16	<15	<15	<14	<14	<14	<14	<16	<70	<18
CHLOROMETHYLMETHYL ETHER	<170	<140	<130	<140	<160	<150	<150 R	<140 R	<140 R	<140 R	<140 R	<160 R	<700 R	<160 R
2-CHLOROTOLUENE	<21	<18	<15	<17	<19	<18	<7 R	<7 R	<7 R	<7 R	<7 R	<8 R	<35 R	<8 R
4-CHLOROTOLUENE	<21	<16	<15	<17	<19	<16	<7 R	<7 R	<7 R	<7 R	<7 R	<8 R	<35 R	<8 R
DIBROMOCHLOROMETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
DIBROMOMETHANE	<23	<18	<17	<18	<20	<20	<15 R	<14 R	<14 R	<14 R	<14 R	<16 R	<70 R	<16 R
1,2-DICHLOROBENZENE	<9	<7	<8	<7	<8	<8	<7	<7	<7	<7	<7	<8	<35	<8
1,3-DICHLOROBENZENE	<9	<7	<8	<7	<8	<8	<7	<7	<7	<7	<7	<8	<35	<8
1,4-DICHLOROBENZENE	<9	<7	<8	<7	<8	<8	<7	<7	<7	<7	<7	<8	<35	<8
DICHLORODIFLUOROMETHANE	<17	<14	<13	<14	<18	<15	<15	<14	<14	<14	<14	<16	<70	<16
1,1-DICHLOROETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1,2-DICHLOROETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1,1-DICHLOROETHYLENE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1,2-DICHLOROETHYLENE (TOTAL)	<2	<1	<1	<1	12	6	<1	<1	<1	<1	<1	5	28	<2
DICHLOROMETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1,2-DICHLOROPROPANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
CIS-1,3-DICHLOROPROPYLENE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
TRANS-1,3-DICHLOROPROPYLENE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
ETHYLBENZENE	3	<1	18	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1,1,2,2-TETRACHLOROETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1,1,1,2-TETRACHLOROETHANE	<19	<15	<14	<15	<17	<17	<1 R	<1 R	<1 R	<1 R	<1 R	<2 R	<7 R	<2 R
TETRACHLOROETHYLENE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
TOLUENE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1,1,1-TRICHLOROETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1,1,2-TRICHLOROETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
TRICHLOROETHYLENE	<2	<1	<1	<1	50	21	<1	<1	<1	<1	<1	10	220	<2
TRICHLOROFLUOROMETHANE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
1,2,3-TRICHLOROPROPANE	<24	<19	<18	<19	<22	<21	<1 R	<1 R	<1 R	<1 R	<1 R	<2 R	<7 R	<2 R
VINYL CHLORIDE	<2	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<7	<2
XYLENE (TOTAL)	<5	<4	<4	<4	<5	<5	<4	<4	<4	<4	<4	<5	<21	<5
FREON 113	<2 V	<1 V	<1 V	<1 V	<2 V	<2 V	<1	<1 V	<1 V	<1 V	<1 V	<2 V	<7 V	<2 V

Notes: See page 4 of 4

TABLE E-1
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SHALLOW SOIL SAMPLING AREA
SAMPLE ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
FEBRUARY AND MARCH 1994

COMPOUND	SAMPLE DATE −25,150 2/28/94	−25,175 2/28/94	−25,200 2/28/94	−25,225 3/11/94	−25,250 3/23/94	−50,0 2/28/94	−50,50 2/28/94	−50,75 2/28/94	−50,125 2/28/94	−50,150 2/28/94	−50,175 2/28/94	−50,200 2/28/94	−50,225 3/11/94	−75,0 2/28/94
BENZENE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1	<1	<2
BENZYL CHLORIDE	<22	<17	<14 R	<14 R	<18	<18 R	<18	<19	<22	<18	<20	<18	<13 R	<20
BIS(2-CHLOROETHOXY)METHANE	<3200	<2500	<680 R	<700 R	<4000	<790 R	<2700	<2700	<3200	<2600	<2900	<2600	<870 R	<2900
BROMOBENZENE	<24	<18	<7 R	<7 R	<19	<8 R	<20	<20	<23	<19	<21	<19	<7 R	<22
BROMODICHLOROMETHANE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
BROMOFORM	<17	<13	<14	<14	<14	<18	<14	<14	<17	<14	<15	<14 V	<13	<15
BROMOMETHANE	<17	<13	<14	<14	<14	<18	<14	<14	<17	<14	<15	<14 V	<13	<15
CARBON TETRACHLORIDE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
CHLOROBENZENE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
CHLOROETHANE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
2-CHLOROETHYLVINYL ETHER	<17	<13	<14	<14	<14	<18	<14	<14	<17	<14	<15	<14 V	<13	<15
CHLOROFORM	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
1-CHLOROHEXANE	<17	<13	<14 R	<14 R	<14	<18 R	<14	<14	<17	<14	<15	<14	<13 R	<15
CHLOROMETHANE	<17	<13	<14	<14	<14	<18	<14	<14	<17	<14	<15	<14 V	<13	<15
CHLOROMETHYLMETHYL ETHER	<170	<130	<140 R	<140 R	<140	<160 R	<140	<140	<170	<140	<150	<140	<130 R	<150
2-CHLOROTOLUENE	<20	<16	<7 R	<7 R	<18	<8 R	<17	<17	<20	<18	<18	<17	<7 R	<18
4-CHLOROTOLUENE	<20	<16	<7 R	<7 R	<18	<8 R	<17	<17	<20	<18	<18	<17	<7 R	<18
DIBROMOCHLOROMETHANE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
DIBROMOMETHANE	<22	<17	<14 R	<14 R	<18	<18 R	<18	<19	<22	<18	<20	<18	<13 R	<20
1,2-DICHLOROBENZENE	<8	<6	<7	<7	<7	<8	<7	<7	<8	<7	<8	<7 V	<7	<8
1,3-DICHLOROBENZENE	<8	<6	<7	<7	<7	<8	<7	<7	<8	<7	<8	<7 V	<7	<8
1,4-DICHLOROBENZENE	<8	<6	<7	<7	<7	<8	<7	<7	<8	<7	<8	<7 V	<7	<8
DICHLORODIFLUOROMETHANE	<17	<13	<14	<14	<14	<18	<14	<14	<17	<14	<15	<14 V	<13	<15
1,1-DICHLOROETHANE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
1,2-DICHLOROETHANE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
1,1-DICHLOROETHYLENE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
1,2-DICHLOROETHYLENE (TOTAL)	<2	<1	<1	<1	<1	<2	<1	<1	32	<1	2	<1 V	<1	<2
DICHLOROMETHANE	<2	<1	<1	4	3	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
1,2-DICHLOROPROPANE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
CIS-1,3-DICHLOROPROPYLENE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
TRANS-1,3-DICHLOROPROPYLENE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
ETHYLBENZENE	<2	<1	11	<1	<1	<2	6	78	<2	<1	<2	<1	<1	<2
1,1,2,2-TETRACHLOROETHANE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
1,1,1,2-TETRACHLOROETHANE	<19	<14	<1 R	<1 R	<15	<2 R	<15	<16	<18	<15	<17	<15 V	<1 R	<17
TETRACHLOROETHYLENE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1	<1	<2
TOLUENE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1	<1	<2
1,1,1-TRICHLOROETHANE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
1,1,2-TRICHLOROETHANE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
TRICHLOROETHYLENE	<2	<1	<1	<1	<1	<2	<1	<1	110	20	6	<1 V	<1	<2
TRICHLOROFLUOROMETHANE	<2	<1	<1	6	<1	<2	<1	<1	<2	<1	<2	<1 V	<1	<2
1,2,3-TRICHLOROPROPANE	<24	<18	<1 R	<1 R	<19	<2 R	<20	<20	<23	<19	<21	<1 V	<1 R	<22
VINYL CHLORIDE	<2	<1	<1	<1	<1	<2	<1	<1	<2	<1	<2	<19	<1	<2
XYLENE (TOTAL)	<5	<4	<4	<4	<4	<5	<4	<4	<5	<4	<5	<4	<4	<5
FREON 113	<2 V	<1 V	<1 V	<1	<1	<2 V	<1 V	<1 V	<2 V	<1 V	<2 V	<1 V	<1	<2 V

Notes: See page 4 of 4

TABLE E-1
BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SHALLOW SOIL SAMPLING AREA
SAMPLE ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
FEBRUARY AND MARCH 1994

	SAMPLE														
	50,100	25,75	25,100	25,125	0,75	0,75*	0,100	0,150	0,225	0,225*	0,250	-25,0	-25,25	-25,50	-25,100
	DATE														
COMPOUND	2/28/94	2/28/94	2/28/94	2/28/94	3/23/94	2/28/94	2/28/94	2/28/94	3/11/94	3/11/94	3/23/94	2/28/94	2/28/94	2/28/94	2/28/94
BENZENE	<1 V	<2	<3	<1 V	<1	<1	<2	<1	<1	<1	<1	<1	<1 V	<1 V	<2
BENZYL CHLORIDE	<18 V	<21	<34	<19	<20	<18	<23	<18	<14 R	<14	<17	<14 R	<17	<13 R	<21
BIS(2-CHLOROETHOXY)METHANE	<2600 V	<3000	<5000	<2700	<2900	<2600	<3400	<2600	<680 R	<2000	<2400	<700 R	<2400	<670 R	<3100
BROMOBENZENE	<19 V	<22	<36	<20	<21	<1900	<25	<19	<7 R	<15	<18	<7 R	<18	<7 R	<23
BROMODICHLOROMETHANE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
BROMOFORM	<14 V	<16	<33	<14	<15	<14	<16	<14	<14	<13	<13	<14	<13	<13	<16
BROMOMETHANE	<14 V	<16	<33	<14	<15	<14	<16	<14	<14	<13	<13	<14	<13	<13	<16
CARBON TETRACHLORIDE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
CHLOROBENZENE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
CHLOROETHANE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
2-CHLOROETHYLVINYL ETHER	<14 V	<16	<33	<14	<15	<14	<16	<14	<14	<13	<13	<14	<13	<13	<16
CHLOROFORM	<1 V	<2	<3	<1	<1	<1	<18	<1	<1	<1	<1	<1	<1	<1	<2
1-CHLOROHEXANE	<14 V	<16	<33	<14	<15	<14	<18	<14	<14 R	<13	<13	<14 R	<13	<13 R	<16
CHLOROMETHANE	<14 V	<16	<33	<14	<15	<14	<18	<14	<14	<13	<13	<14	<13	<13	<16
CHLOROMETHYLMETHYL ETHER	<140 V	<160	<330	<140	<150	<140	<180	<140	<140 R	<130	<130	<140 R	<130	<130 R	<180
2-CHLOROTOLUENE	<17 V	<19	<31	<17	<18	<16	<21	<16	<7 R	<13	<15	<7 R	<15	<7 R	<19
4-CHLOROTOLUENE	<17 V	<19	<31	<17	<16	<16	<21	<16	<7 R	<13	<15	<7 R	<15	<7 R	<19
DIBROMOCHLOROMETHANE	<1 V	<2	<3	<1	<1	<1	#	<1	<1	<1	<1	<1	<1	<1	<16
DIBROMOMETHANE	<18 V	<21	<34	<19	<20	<18	<23	<18	<14 R	<14	<17	<14 R	<17	<13 R	<21
1,2-DICHLOROBENZENE	<7 V	<8	<16	<7	<7	<7	<9	<7	<7	<6	<6	<7	<6	<7	<8
1,3-DICHLOROBENZENE	<7 V	<8	<16	<7	<7	<7	<9	<7	<7	<6	<6	<7	<6	<7	<8
1,4-DICHLOROBENZENE	<7 V	<8	<16	<7	<7	<7	<9	<7	<7	<6	<6	<7	<6	<7	<8
DICHLORODIFLUOROMETHANE	<14 V	<16	<33	<14	<15	<14	<18	<14	<14	<13	<13	<14	<13	<13	<16
1,1-DICHLOROETHANE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
1,2-DICHLOROETHANE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
1,1-DICHLOROETHYLENE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
1,2-DICHLOROETHYLENE (TOTAL)	<1 V	16	40	<1	3	<1	200	<1	<1	<1	<1	<1	<1	<1	69
DICHLOROMETHANE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
1,2-DICHLOROPROPANE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<16
CIS-1,3-DICHLOROPROPYLENE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<16
TRANS-1,3-DICHLOROPROPYLENE	<1 V	<2	<3	<1	<1	<1	#	<1	<1	<1	<1	<1	<1	<1	<16
ETHYLBENZENE	150 V	<2	<3	<1 V	3	<1	<2	<1	1	1	71	<1	1	<1 V	<2
1,1,2,2-TETRACHLOROETHANE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
1,1,1,2-TETRACHLOROETHANE	<15 V	<17	<29	<16	<17	<15	<19	<15	<1 R	<12	<14	<1 R	<14	<1 R	<18
TETRACHLOROETHYLENE	<1 V	<2	<3	<1 V	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1 V	<2
TOLUENE	<1 V	<2	<3	<1 V	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1 V	<2
1,1,1-TRICHLOROETHANE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
1,1,2-TRICHLOROETHANE	<1 V	<2	<3	<1	<1	<1	4#	<1	<1	<1	<1	<1	<1	<1	<16
TRICHLOROETHYLENE	<1 V	60	51	<1	15	11	160	<1	<1	<1	<1	<1	<1	<1	190
TRICHLOROFLUOROMETHANE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
1,2,3-TRICHLOROPROPANE	<19 V	<22	<36	<20	<21	<19	<25	<19	<1 R	<12	<18	<1 R	<18	<1 R	<23
VINYL CHLORIDE	<1 V	<2	<3	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<2
XYLENE (TOTAL)	<4 V	<5	<10	<4 V	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4 V	<5
FREON 113	<1 V	<2 V	<3 V	<1 V	<1 V	<1 V	<2 V	<1 V	<1	<1	<1	<1 V	<1 V	<1 V	3 V

Notes: See page 4 of 4

APPENDIX F

Volatilization from On-Site Soil

APPENDIX F

Volatilization from On-Site Soil

Introduction

This appendix provides the equations used to determine chemical volatilization to air based on the soil chemical concentrations. USEPA (1991b; 1992b) recommends using a volatilization factor (VF) to define this relationship. Equations provided by USEPA (1991b; 1992b) are used here to calculate VF for organic chemicals observed in soils.

Volatilization Model

The VF equations presented by USEPA (1991b; 1992b) assume that the chemical concentration in the soil is homogenous and that the source material is not covered by "clean" soil material. This approach over-predicts volatilization potential in those instances where "clean" soil covers the source material.

The following equation is used to calculate VF for an organic chemical of interest in soil:

$$VF\ (m^3/kg) = \frac{(LS \times V \times DH)}{A} \times \frac{(3.14 \times a \times T)^{1/2}}{(2 \times D_{ei} \times P_a \times K_{as} \times CF)} \qquad \textbf{EQUATION (F-1)}$$

where:

LS	=	length of side of excavated area (m);
V	=	wind speed in mixing zone (m/s);
DH	=	diffusion height (m);
A	=	area of excavation (cm^2);
T	=	exposure interval (s);
D_{ei}	=	effective diffusivity (cm^2/s) = $D_i \times (P_a^{3.33}/P_t^2)$;
K_{as}	=	soil/air partition coefficient (g soil/cm^3 air) = $(H/K_d) \times 41$;
D_i	=	molecular diffusivity in air (cm^2/s);
H	=	Henry's Law constant (atm-m^3/mol);
K_d	=	soil-water partition coefficient (cm^3/g) = $K_{oc} \times OC$;
K_{oc}	=	organic carbon partition coefficient (cm^3/g);
OC	=	organic carbon content of the soil (unitless);
a	=	$\dfrac{(D_{ei} \times P_a)}{P_a + (p_s \times (1 - P_a))/K_{as}}$ (cm);
p_s	=	true soil density (g/cm^3);
P_a	=	airfilled soil porosity = $P_t - \Theta B$ (unitless);
P_t	=	total soil porosity = $1-(B/p_s)$ (unitless);
Θ	=	soil moisture content (cm^3-water/g-soil);
B	=	soil bulk density (g/cm^3); and
CF	=	conversion factor (10^{-3} kg/g).

Standard default parameters are recommended in USEPA (1991b; 1992b) that represent typical site conditions. These values are listed in Table F-1. Chemical-specific parameters are presented in Table F-2 along with the calculated VF for each organic chemical of interest in soil.

The calculated VF was combined with soil concentration to determine vapor concentration using the following equation:

$$C_v\ (ug/m^3) = \frac{C_s}{VF} \qquad \textbf{EQUATION (F-2)}$$

where:

C_v = vapor concentration (ug/m^3);
C_s = RME soil concentration (ug/kg); and
VF = volatilization factor (m^3/kg).

Results

The estimated soil-to-air vapor concentrations are presented in Table F-3.

TABLE F-1

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PARAMETERS USED IN CALCULATING CHEMICAL-SPECIFIC VOLATILIZATION FACTORS

	Definition		Value
Excavation scenario			
LS	Length of excavated area		45 m
V	Wind speed in mixing zone		2.25 m/s
DH	Diffusion height		2 m
A	Area of excavation		20,250,000 cm^2
p_s	True soil density		2.65 g/cm^3
OC	Organic carbon content of the soil		0.02
B	Soil bulk density		1.5 g/cm^3
Theta	Soil moisture content		0.10
T	Exposure interval		
		Worker:	7.9E+8 sec
		Resident:	2.2E+9 sec

Source:

USEPA, 1991b.

TABLE F-2

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CHEMICAL-SPECIFIC PARAMETERS FOR CALCULATING VOLATILIZATION FACTORS

Chemical	D_i at 25°C (cm^2/s)	H at 25°C (atm-m^3/mol)	K_{oc} (*) (cm^3/g)	D_{ei}(*) (cm^2/s)	K_{as} (*) (g soil/cm^3 air)	a (*) (cm^2/s)	Worker VF (*) (m^3/kg)	Resident VF(*) (m^3/kg)
VOLATILE ORGANICS								
1,2-DICHLOROETHENE	9.1E-02	5.0E-03	113	0.00727	9.0E-02	1.9E-04	1.8E+04	3.1E+04
METHYLENE CHLORIDE	9.7E-02	2.7E-03	17	0.00777	3.2E-01	7.2E-04	9.4E+03	1.6E+04
ETHYLBENZENE	8.7E-02	8.4E-03	1249	0.00696	1.4E-02	2.7E-05	4.8E+04	8.1E+04
TOLUENE	9.3E-02	5.9E-03	483	0.00747	2.5E-02	5.3E-05	3.5E+04	5.8E+04
1,1,1-TRICHLOROETHANE	7.7E-02	8.0E-03	281	0.00621	5.9E-02	1.0E-04	2.5E+04	4.1E+04
1,1,2-TRICHLOROETHANE	7.7E-02	9.1E-04	104	0.00621	1.8E-02	3.2E-05	4.5E+04	7.5E+04
TRICHLOROETHENE	7.8E-02	1.0E-02	239	0.00626	8.6E-02	1.5E-04	2.0E+04	3.4E+04
TRICHLOROFLUOROMETHANE	7.6E-02	9.7E-02	307	0.00612	6.5E-01	1.1E-03	7.5E+03	1.3E+04
FREON 113	6.5E-02	5.3E-01	1715	0.00524	6.3E-01	9.4E-04	6.2E+03	1.4E+04
XYLENES	8.7E-02	6.7E-03	1278	0.00696	1.1E-02	2.1E-05	5.5E+04	9.2E+04
SEMIVOLATILE ORGANICS								
NAPHTHALENE	7.9E-02	4.2E-04	1755	0.00633	5.0E-04	6.9E-07	2.7E+05	4.5E+05
2-METHYLNAPHTHALENE	7.5E-02	3.7E-04	6232	0.00601	1.2E-04	2.1E-07	5.5E+05	9.2E+05
ACENAPHTHENE	7.2E-02	1.6E-04	7139	0.00577	4.5E-05	7.3E-08	9.3E+05	1.6E+06
DIBENZOFURAN	6.9E-02	5.1E-04	11226	0.00553	9.2E-05	1.5E-07	6.6E+05	1.1E+06
DIETHYLPHTHALATE	6.0E-02	4.8E-07	268	0.00481	3.7E-06	5.0E-09	3.6E+06	6.0E+06
FLUORENE	6.9E-02	8.4E-05	12859	0.00556	1.3E-05	2.1E-08	1.7E+06	2.9E+06
PHENANTHRENE	6.7E-02	4.0E-05	24236	0.00537	3.3E-06	5.1E-09	3.5E+06	5.9E+06
ANTHRACENE	6.7E-02	6.5E-05	23694	0.00537	5.6E-06	8.6E-09	2.7E+06	4.6E+06
DI-n-BUTYLPHTHALATE	5.4E-02	2.2E-06	43658	0.00430	1.0E-07	1.3E-10	2.2E+07	3.8E+07
FLUORANTHENE	6.3E-02	1.3E-08	135375	0.00504	1.9E-10	2.7E-13	4.8E+08	8.1E+08
PYRENE	6.3E-02	1.1E-05	52321	0.00504	4.3E-07	6.2E-10	1.0E+07	1.7E+07
BENZO(a)ANTHRACENE	5.9E-02	9.8E-07	645372	0.00474	3.1E-09	4.2E-12	1.2E+08	2.1E+08
CHRYSENE	5.9E-02	9.5E-05	645372	0.00474	3.0E-07	4.0E-10	1.3E+07	2.1E+07
BENZO(b)FLUORANTHENE	5.6E-02	1.1E-04	480661	0.00451	4.7E-07	6.1E-10	1.0E+07	1.7E+07
BENZO(k)FLUORANTHENE	5.6E-02	4.0E-07	1956501	0.00451	4.2E-10	5.4E-13	3.4E+08	5.6E+05
BENZO(a)PYRENE	5.6E-02	1.6E-06	480661	0.00451	7.8E-09	9.9E-12	8.0E+07	1.3E+08
INDENO(1,2,3-c,d)PYRENE	5.4E-02	1.6E-06	3445323	0.00431	9.5E-10	1.2E-12	2.3E+08	3.9E+08
DIBENZ(a,h)ANTHRACENE	5.4E-02	1.2E-04	503130	0.00430	4.7E-07	5.7E-10	1.1E+07	1.8E+07
BENZO(g,h,i)PERYLENE	5.4E-02	1.4E-07	9540695	0.00431	3.1E-11	3.8E-14	1.3E+09	2.2E+09

Notes:

K_{oc} = Organic carbon partition coefficient.
D_{ei} = Effective diffusivity.
K_{as} = Soil/air partition coefficient.
a = Calculated term.
VF = Volatilization factor.
K_{as} = Soil/air partition coefficient.
a = Calculated term.
VF = Volatilization factor.

Sources:

USEPA, 1988; 1993b; 1994c.
See also Appendix I.
(*) Calculated.

TABLE F–3

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SOIL–TO–AIR VAPOR CONCENTRATIONS

Chemical	Worker Vapor Concentration (ug/m^3)	Resident Vapor Concentration (ug/m^3)
VOLATILE ORGANICS		
1,2–DICHLOROETHENE	1.1E–03	6.5E–04
METHYLENE CHLORIDE	1.2E–04	7.0E–05
ETHYLBENZENE	2.2E–04	1.3E–04
TOLUENE	5.0E–04	3.0E–04
1,1,1–TRICHLOROETHANE	3.2E–05	1.9E–05
1,1,2–TRICHLOROETHANE	2.5E–05	1.5E–05
TRICHLOROETHENE	3.3E–03	2.0E–03
TRICHLOROFLUOROMETHANE	2.5E–04	1.5E–04
FREON 113	1.1E–04	6.6E–05
XYLENES	2.7E–04	1.6E–04
SEMIVOLATILE ORGANICS		
NAPHTHALENE	3.7E–03	2.2E–03
2–METHYLNAPHTHALENE	1.1E–03	6.8E–04
ACENAPHTHENE	1.7E–03	1.0E–03
DIBENZOFURAN	1.2E–03	7.4E–04
DIETHYLPHTHALATE	1.7E–05	1.0E–05
FLUORENE	8.2E–04	4.9E–04
PHENANTHRENE	2.3E–03	1.4E–03
ANTHRACENE	7.0E–04	4.2E–04
DI–n–BUTYLPHTHALATE	3.6E–06	2.2E–06
FLUORANTHENE	2.0E–05	1.2E–05
PYRENE	7.5E–04	4.5E–04
BENZO(a)ANTHRACENE	3.6E–05	2.2E–05
CHRYSENE	2.3E–04	1.4E–04
BENZO(b)FLUORANTHENE	4.8E–04	2.9E–04
BENZO(k)FLUORANTHENE	4.6E–06	2.8E–06
BENZO(a)PYRENE	3.5E–05	2.1E–05
INDENO(1,2,3–c,d)PYRENE	8.1E–06	4.9E–06
DIBENZ(a,h)ANTHRACENE	6.6E–05	4.0E–05
BENZO(g,h,i)PERYLENE	1.5E–06	9.0E–07

APPENDIX G

Volatilization from Ground Water During Hypothetical Future Trench Excavation

APPENDIX G

Volatilization from Ground Water During Hypothetical Future Trench Excavation

Introduction

Presented below is a modeling approach for estimating vapor concentrations associated with chemical volatilization from ground water during a hypothetical excavation job. The model approach is a combination of a vapor emissions model and a breathing space zone model to calculate vapor concentrations in breathing space air. These models have been selected and applied in a manner which provides a conservative estimate of on-site vapor concentrations for the organic chemicals of interest in ground water.

To apply these models, several assumptions had to be made regarding the physical characteristics of the site. Since the excavation scenario being modeled is hypothetical and it is uncertain exactly what a given excavation job would entail, a very conservative approach was taken to provide an upper-bound estimate of probable emission rates. This has been achieved through the combined usage of several conservative exposure assumptions. These assumptions include use of maximum detected ground-water concentrations, no reduction in source concentration with time, midday summer temperature, and a conservative assumption of source size. Thus, emission rates during a given excavation scenario are not expected to be higher than those estimated, and in fact, are most likely to be less.

The organic chemicals of interest are listed in Table G-1, along with pertinent ground-water concentration data and chemical/physical property data needed for performing the emissions calculations. Model input values representing site physical characteristics are listed in Table G-2.

Volatilization Model

The empirical model of Mackay and Leinonen (1975), presented in the Superfund Exposure Assessment Manual (USEPA, 1988), was used to estimate emission rates from ground water during a hypothetical excavation scenario. This model predicts the rate of emissions under steady-state conditions assuming that ground water would pond within the trench. The model applies to a well-mixed aqueous phase. The emissions equation is as follows:

$$E_i = K_i \times C_i \times A \times 3{,}600 \times 10^{-3} \qquad \textbf{EQUATION G-1}$$

where:

E_i	=	Emission rate from ground water (mg/hr);
K_i	=	Overall mass transfer coefficient (cm/sec);
C_i	=	Concentration of chemical i in ground water (mg/L);
A	=	Area of exposed ground-water surface (cm^2);
3,600	=	Conversion factor (3,600 sec = 1 hour); and
10^{-3}	=	Conversion factor (10^{-3} L = 1 cm^3).

The overall mass transfer coefficient (K_i) was calculated via the following relationship:

$$1/K_i = 1/k_{i,L} + RT/(H_i \times k_{i,G}) \qquad \textbf{EQUATION G-2}$$

where:

K_i	=	Overall mass transfer coefficient for chemical i (cm/sec);
$k_{i,L}$	=	Liquid phase mass transfer coefficient for chemical i (cm/sec);
R	=	Ideal gas law constant (8.2×10^{-5} atm-m^3/mole-°K);
T	=	Absolute temperature (303°K);
H_i	=	Henry's Law constant for chemical i (atm-m^3/mole); and
$k_{i,G}$	=	Gas phase mass transfer coefficient for chemical i (cm/sec).

The liquid phase mass transfer coefficient ($k_{i,L}$) was calculated using the following equation:

$$k_{i,L} = (32/MW_i)^{0.5} \times (T/298) \times (k_{L,}O_2) \qquad \textbf{EQUATION G-3}$$

where:

32	=	Molecular weight of O_2;
MW_i	=	Molecular weight of chemical i;
T	=	Absolute temperature (303°K); and
$k_{L,}O_2$	=	Liquid-phase mass transfer coefficient for oxygen at 25°C (0.0008 cm/sec - obtained from Lyman et al., 1990).

The gas phase mass transfer coefficient ($k_{i,G}$) was calculated using the following equation:

$$k_{i,G} = (18/MW_i)^{0.335} \times (T/298)^{1.005} \times k_{G,}H_2O \qquad \textbf{EQUATION G-4}$$

where:

18	=	Molecular weight of H_2O;
MW_i	=	Molecular weight of chemical i;
T	=	Absolute temperature (303°K); and
$k_{G,}H_2O$	=	Gas-phase mass transfer coefficient for water at 25°C (0.11 cm/sec - obtained from Lyman et al., 1990).

On-site Vapor Concentrations

To estimate the concentration of chemicals in the ambient air in the immediate vicinity of the excavation area, a "box" model is used. The "box" model provides a conservative estimate of ambient air concentrations by assuming that the air space into which the material has volatilized is well mixed up to the height of an average human. In reality, the vapors will be dispersed and diluted within this air space. Thus, the "box" model is yet another conservative element in vapor concentration calculations. The "box" model equation is as follows:

$$C_i = \frac{E_i}{W \times H \times v \times 3600} \; (mg/m^3) \qquad \textbf{EQUATION G-5}$$

where:

C_i	=	Upper-bound vapor concentration of chemical i on site (mg/m^3);
E_i	=	Emission rate of chemical i (mg/hr);
W	=	Width of the area from which the vapors are originating (m);
H	=	Assumed height of the receptor (m);
v	=	Wind speed (m/sec); and
3600	=	Conversion factor, 3600 sec = 1 hr.

The input parameters used in the "box" model are listed in Table G-2.

Model Results

Model results are presented in Table G-3. Results include the emissions rate estimates and ambient on-site vapor concentrations estimates for chemical volatilization from ground water. The on-site vapor concentrations are used to calculate potential air exposure concentrations as described in the Risk Assessment text.

TABLE G−1

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TRENCH EXCAVATION MODEL
CHEMICAL PROPERTIES

CHEMICAL	MOLECULAR WEIGHT	HENRY'S LAW CONSTANT (atm−m^3/mole)
VOLATILE ORGANICS		
ACETONE	58	3.7E−05
BENZENE	78	5.4E−03
2−BUTANONE	72	1.1E−05
1,1−DICHLOROETHANE	99	5.9E−03
1,1−DICHLOROETHENE	97	1.5E−01
1,2−DICHLOROETHENE	97	5.0E−03
FREON 113	187	5.3E−01
METHYLENE CHLORIDE	85	3.5E−06
TETRACHLOROETHENE	166	1.8E−02
TOLUENE	92	5.9E−03
1,1,1−TRICHLOROETHANE	133	8.0E−03
TRICHLOROETHENE	131	1.0E−02
VINYL CHLORIDE	63	1.1E−03
SEMIVOLATILE ORGANICS		
2−METHYLPHENOL	108	1.6E−06
4−METHYLPHENOL	108	9.6E−07
DIETHYLPHTHALATE	222	4.8E−07
DI−N−BUTYLPHTHALATE	278	2.2E−06
BIS(2−ETHYLHEXYL)PHTHALATE	391	1.1E−05

TABLE G-2

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TRENCH EXCAVATION MODEL INPUT VALUES

Parameter	Description	Value
Volatilization Model Input		
C_i	Concentration of chemical i in ground water	see Table G-3
A	Area of trench base	2.23E+06 cm^2 (400'x6')
H_i	Henry's Law constant of chemical i	see Table G-1
MW_i	Molecular weight of chemcial i	see Table G-1
R	Ideal gas constant	8.2E-05 atm-m^3/mole-K
T	Ambient temperature	303 K
$k_L O_2$	Liquid-phase mass transfer coefficient for oxygen	0.0008 cm/sec
$k_G H_2O$	Gas-phase mass transfer coefficient for water	0.11 cm/sec
"Box" model input		
E_i	Chemical emission rate from ground water	see Table G-3
W	Length of trench	122 m (400 feet)
H	Receptor height (from ground surface)	1.8 m (6 feet)
v	Wind speed	5 m/sec

TABLE G–3

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REMEDIAL INVESTIGATION ADDENDUM REPORT

EXCAVATION MODEL
ESTIMATED VAPOR CONCENTRATIONS

CHEMICAL	MAXIMUM DETECTED GROUND WATER CONCENTRATION (mg/L)	EMISSIONS RATE (mg/hr)	EXCAVATION VAPOR CONCENTRATION (ug/m^3)
<u>VOLATILE ORGANICS</u>			
ACETONE	0.01	7.6E+00	1.9E–03
BENZENE	0.092	3.7E+02	9.4E–02
2–BUTANONE	0.002	4.5E–01	1.1E–04
1,1–DICHLOROETHANE	0.023	8.3E+01	2.1E–02
1,1–DICHLOROETHENE	0.009	3.4E+01	8.5E–03
1,2–DICHLOROETHENE	7.9	2.9E+04	7.2E+00
FREON 113	1.1	3.0E+03	7.5E–01
METHYLENE CHLORIDE	0.1	7.4E+00	1.9E–03
TETRACHLOROETHENE	0.46	1.3E+03	3.3E–01
TOLUENE	0.017	6.3E+01	1.6E–02
1,1,1–TRICHLOROETHANE	11	3.4E+04	8.7E+00
TRICHLOROETHENE	62	2.0E+05	5.0E+01
VINYL CHLORIDE	3.6	1.4E+04	3.6E+00
<u>SEMIVOLATILE ORGANICS</u>			
2–METHYLPHENOL	0.004	1.3E–01	3.2E–05
4–METHYLPHENOL	0.002	3.8E–02	9.6E–06
DIETHYLPHTHALATE	0.014	1.0E–01	2.6E–05
DI–N–BUTYLPHTHALATE	0.003	9.4E–02	2.4E–05
BIS(2–ETHYLHEXYL)PHTHALATE	0.001	1.3E–01	3.3E–05

APPENDIX H

Dermal Absorption

APPENDIX H

Dermal Absorption

Introduction

To assess dermal exposure to chemicals present in water, a compound's dermal absorption potential must first be determined. The value used to represent a chemical's dermal absorption potential is the permeability coefficient (K_p). K_p is the amount of chemical in an aqueous solution that will pass through skin over a period of time. A complete discussion of this value, and the factors affecting the K_p of a compound, can be found in USEPA (1992a). USEPA (1992a) recommends K_p values for inorganics and a number of organic chemicals, as well as methods for determining dermally absorbed doses of these chemicals.

The default K_p value for inorganics is 1E-03 cm/hour (USEPA, 1992a). K_p values for organic compounds are estimated as described below.

Estimating K_p for Organic Compounds

The method used here to estimate K_p is a nonsteady-state approach for estimating a dermally absorbed dose from water. This method is currently believed to be the most accurate reflection of normal human exposure during bathing/showering, since the short contact times associated with bathing/showering generally mean that steady state will not occur. This method also accounts for the dose that can occur after the actual exposure event, due to absorption of chemicals stored in skin lipids. However, the approach is only applicable to organics which exhibit octanol-water partitioning (USEPA, 1992a). Since inorganics do not exhibit octanol-water partitioning, the method is not applicable to inorganics.

To estimate dermally absorbed dose (DA) per event, the following equation is used:

$$DA = \frac{2\,K_p\,C_w\,(6r\,t_{event}/\pi)^{1/2}}{CF} \qquad \textbf{EQUATION (H-1)}$$

Where:

DA = Dermally absorbed dose per event (mg/cm^2-event);
K_p = Chemical-specific permeability coefficient from water (cm/hour);
C_w = Chemical concentration in water (mg/L);
CF = Conversion factor (1000 cm^3/L);
r = Chemical-specific constant (hours); and
t_{event} = Time duration of exposure event (0.2 hours).

Table H-1 lists the necessary input parameters for Equation H-1.

Estimating Dermally Absorbed Dose

Dermally absorbed doses calculated for each of the organic chemicals of interest in ground water are provided in Table H-1. These doses are used in risk calculations to estimate daily intakes from hypothetical residential dermal exposure to ground water during bathing/showering.

TABLE H-1

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

ESTIMATION OF DERMALLY ADSORBED DOSE
HYPOTHETICAL FUTURE RESIDENT BATHING/SHOWERING SCENARIO

Chemical	RME Ground Water Concentration (mg/L)	K_p (cm/hour)	r (hour)	DA (mg/cm^2-event)
Volatile Organic Compounds				
Acetone	0.01	0.0011 [a,b]	0.24	6.66E-09
Benzene	0.092	0.021	0.26	1.22E-06
2-Butanone	0.002	0.0011	0.24	1.33E-09
1,1-Dichloroethane	0.023	0.0089	0.35	1.50E-07
1,1-Dichloroethene	0.009	0.016	0.34	1.04E-07
1,2-Dichloroethene	7.9	0.01	0.34	5.69E-05
Dichloromethane (methylene chloride)	0.1	0.0045 [a,c]	0.29	3.00E-07
Freon 113	1.1	0.012	0.48	1.13E-05
Tetrachlorethene	0.46	0.048	0.9	2.59E-05
Toluene	0.017	0.045	0.32	5.35E-07
1,1,1-Trichloroethane	11	0.017	0.57	1.75E-04
Trichloroethene	62	0.016	0.55	9.09E-04
Vinyl Chloride	3.6	0.0073	0.21	1.49E-05
Semivolatile Organic Compounds				
2-Methylphenol (o-cresol)	0.004	0.01	0.4	3.13E-08
4-Methylphenol (p-cresol)	0.002	0.01	0.4	1.56E-08
Diethylphthalate	0.14	0.0048	2	1.17E-06
Di-n-butylphthalate	0.003	0.0033	4.3	2.54E-08
Bis(2-ethylhexyl)phthalate	0.001	0.0033	21	1.87E-08

Notes:

DA = dermally exposed dose per event
K_p = permeability coefficient from water
r = chemical-specific constant (USEPA, 1992a)
[a] No K_p value is available for this compound.
[b] The K_p value for 2-butanone was used for acetone.
[c] The K_p value for dichlorofluorometrame was used for Freon 113.

APPENDIX I

Shower Model

APPENDIX I

Shower Model

Introduction

Presented below is a modeling approach to estimate inhalation exposure point concentrations for a residential showering scenario. The shower model predicts potential chemical concentrations in bathroom air for chemical volatilization from shower water droplets. The shower model provides inhalation exposure concentrations associated with tap water hypothetically supplied by ground water potentially impacted by the Bausch & Lomb site.

Modeling Approach

The shower model predicts average inhalation exposure concentrations over a reasonable maximum shower duration (i.e., 12 minutes) in a closed bathroom with an exhaust fan operating approximately 50 percent of the time. The model assumes initial air concentrations are negligible at the start of the shower, but increase as chemical vapors accumulate in the bathroom during showering. The model scenario has been developed to provide conservative estimates for risk characterization. The modeling approach is based on the work of Andelman (1985a) and McKone (1988).

The shower model assumes the bathroom is a single well-mixed chamber into which chemicals volatilize. The model also assumes that entry of chemicals into the bathroom is continual throughout the duration of the shower. Based on these assumptions, the chemical vapor mass is derived as a function of time using the following chemical mass balance equation (Andelman, 1985a).

$$(dM_{ai}(t)/dt) = S_i - ACH \times M_{ai}(t) \qquad \textbf{EQUATION (I-1)}$$

Where:

$M_{ai}(t)$	=	Chemical mass of Chemical i in bathroom air at time = t (ug);
S_i	=	Volatilization rate of Chemical i (ug/min);
ACH	=	Bathroom air change rate (1/min); and
t	=	Time elapsed since the beginning of the shower (min).

Equation F-1 is a first order linear differential equation. The solution to Equation F-1 provides mass of chemical vapor ($M_{ai}(t)$) in the bathroom at time = t, as follows:

$$M_{ai}(t) = (S_i/ACH) \times (1 - e^{-(ACH)t}) \qquad \textbf{EQUATION (I-2)}$$

Chemical vapor concentration ($C_{ai}(t)$) is subsequently obtained by dividing mass of chemical vapor in air by the bathroom volume, as follows:

$$C_{ai}(t) = M_{ai}(t)/V \qquad \textbf{EQUATION (I-3)}$$

Where:

$C_{ai}(t)$ = Vapor concentration of Chemical i in air at time = t (ug/m^3); and
V = Bathroom volume (m^3).

The chemical volatilization rates (S_i ug/min) for each chemical of interest are used in calculating chemical vapor concentrations. Volatilization rates are derived using the following equation.

$$S_i = F \times C_{wi} \times E_i \times 1000 \qquad \textbf{EQUATION (I-4)}$$

Where:

F = Tap water flow rate (L/min);
C_{wi} = Concentration of Chemical i in tap water (mg/L);
E_i = Mass transfer efficiency for Chemical i from water droplets during showering (unitless); and
1000 = Conversion factor (1000 ug/mg).

The chemical mass transfer efficiency during showering (E_i) is calculated using the method of McKone (1988), which is based on prediction of chemical volatilization potential relative to scientific data for radon:

$$E_i = E_{Rn} \times K(i)/K(Rn) \qquad \textbf{EQUATION (I-5)}$$

$$K(i)/K(Rn) = \frac{1/[2.5/D_w^{0.667} + RT/(H \times D_a^{0.667})]_i}{1/[2.5/D_w^{0.667} + RT/(H \times D_a^{0.667})]_{Rn}} \qquad \textbf{EQUATION (I-6)}$$

Where:

E_{Rn} = Radon mass transfer efficiency from water droplets during showering (65 percent);
D_w = Chemical diffusion coefficient in water (m^2/sec);
D_a = Chemical diffusion coefficient in air (m^2/sec);
H = Henry's Law Constant (mmHg-m^3/mole);
R = Ideal gas constant (0.0624 mmHg-m^3/mole-K); and
T = Absolute temperature (293 K, as per McKone (1988)).

The model equations listed above are solved to obtain chemical concentrations at one minute intervals throughout a reasonable maximum shower duration (i.e., 12 minutes). The vapor concentrations ($C_{ai}(t)$) are then combined to obtain a time-averaged inhalation exposure concentration for each chemical of interest, as follows:

$$C_{v,i} = \sum_{t=0}^{t=12} [C_{ai}(t)] / (13)$$

EQUATION (I-7)

The term $C_{v,i}$ represents the time-weight average vapor concentration in air during showering for Chemical i.

The input values used in the shower model are listed in Tables I-1 through I-3. The selected model input values are conservative values based on information published in scientific articles and reports (referenced in Tables I-1) and professional judgement. The tap water concentrations are maximum detected concentrations in ground water. The combined model input values yield inhalation concentrations that are upper-bound estimates of exposure during showering.

Results

The chemical vapor concentrations obtained using the shower model are presented in Table I-4.

TABLE I–1

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SHOWER MODEL
MODEL INPUT VALUES

VARIABLE	DESCRIPTION	VALUE	UNITS	REFERENCE
ACH	Bathroom air change rate.	0.05	1/min	a, b
C_{wi}	Chemical concentration in tap water.	see Table I–2	ug/L	–
D_{ai}	Chemical diffusion coefficient in air.	see Table I–3	m^2/sec	calculated
D_{aRn}	Radon diffusion coefficient in air.	2.0 E–05	m^2/sec	d
D_{wi}	Chemical diffusion coefficient in water.	see Table I–3	m^2/sec	calculated
D_{wRn}	Radon diffusion coefficient in water.	1.4 E–09	m^2/sec	d
E_i	Chemical mass transfer efficiency.	see Table I–3	unitless	calculated
E_{Rn}	Radon mass transfer efficiency.	0.65	unitless	d
F	Water flow rate.	18.94	L/min	c, e
H	Henry's Law constant.	see Table I–3	mmHg–m^3/mol	–
H_{Rn}	Henry's Law constant for radon.	70	mmHg–m^3/mol	d
t	Time elapsed since start of shower.	0 to 12	min	e, f
V	Bathroom volume.	20	m^3	c

Notes:
- a Andelman (1985a).
- b Andelman (1985b).
- c McKone (1988).
- d McKone and Knezovich (1989).
- e USEPA (1992a).
- f USEPA (1989).

TABLE I–2

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CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SHOWER MODEL
TAP WATER CONCENTRATIONS

Chemical	Maximum Detected Ground Water Concentration (mg/L)
VOLATILE ORGANICS	
ACETONE	0.01
BENZENE	0.092
2–BUTANONE	0.002
1,1–DICHLOROETHANE	0.023
1,1–DICHLOROETHENE	0.009
1,2–DICHLOROETHENE	7.9
FREON 113	1.1
METHYLENE CHLORIDE	0.1
TETRACHLOROETHENE	0.46
TOLUENE	0.017
1,1,1–TRICHLOROETHANE	11
TRICHLOROETHENE	62
VINYL CHLORIDE	3.6
SEMIVOLATILE ORGANICS	
2–METHYLPHENOL	0.004
4–METHYLPHENOL	0.002
DIETHYLPHTHALATE	0.014
DI–N–BUTYLPHTHALATE	0.003
BIS(2–ETHYLHEXYL)PHTHALATE	0.001

TABLE I-3

BAUSCH & LOMB FRAME CENTER
CHILI, NEW YORK
REMEDIAL INVESTIGATION ADDENDUM REPORT

SHOWER MODEL
CHEMICAL PROPERTIES

CHEMICAL	MOLECULAR WEIGHT	D_a (m^2/sec)	D_w (m^2/sec)	HENRY'S LAW CONSTANT (mmHg−m^3/mole)	RATIO K(i) to K(Rn) (unitless)	MASS TRANSFER EFFICIENCY (unitless)
VOLATILE ORGANICS						
ACETONE	58	1.2E−05	1.2E−09	0.028	0.58	0.38
BENZENE	78	1.0E−05	1.0E−09	4.13	0.82	0.53
2−BUTANONE	72	1.1E−05	1.1E−09	0.008	0.28	0.18
1,1−DICHLOROETHANE	99	9.0E−06	9.3E−10	4.5	0.76	0.49
1,1−DICHLOROETHENE	97	9.1E−06	9.4E−10	114	0.77	0.50
1,2−DICHLOROETHENE	97	9.1E−06	9.4E−10	3.8	0.76	0.50
FREON 113	187	6.5E−06	6.8E−10	403	0.62	0.40
METHYLENE CHLORIDE	85	9.7E−06	1.0E−09	2.0	0.80	0.52
TETRACHLOROETHENE	166	6.9E−06	7.2E−10	14	0.64	0.42
TOLUENE	92	9.3E−06	9.7E−10	4.5	0.78	0.51
1,1,1−TRICHLOROETHANE	133	7.7E−06	8.0E−10	6.1	0.69	0.45
TRICHLOROETHENE	131	7.8E−06	8.1E−10	7.6	0.69	0.45
VINYL CHLORIDE	63	1.1E−05	1.2E−09	0.81	0.87	0.56
SEMIVOLATILE ORGANICS						
2−METHYLPHENOL	108	8.6E−06	8.9E−10	0.001	0.05	0.03
4−METHYLPHENOL	108	8.6E−06	8.9E−10	0.0007	0.03	0.02
DIETHYLPHTHALATE	222	6.0E−06	6.2E−10	0.0004	0.01	0.01
DI−N−BUTYLPHTHALATE	278	5.4E−06	5.6E−10	0.002	0.05	0.03
BIS(2−ETHYLHEXYL)PHTHALATE	391	4.5E−06	4.7E−10	0.008	0.16	0.11

Notes:
Diffusivities in air (D_a) and water (D_w) were calculated as follows (Thibideaux, 1979):

$D_{a,1}/D_{a,2}$ = $(MW_2/MW_1)^{0.5}$ and
$D_{w,1}/D_{w,2}$ = $(MW_2/DW_1)^{0.5}$

where:
1,2 = chemical 1 and 2, respectively
MW = molecular weight

Diffusivities were calculated assuming that chemical 2 was trichloroethene (TCE).
$D_{a,TCE}$ and $D_{w,TCE}$ were obtained from McKone (1988).

TABLE I–4

BAUSCH & LOMB FRAME CENTER
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REMEDIAL INVESTIGATION ADDENDUM REPORT

SHOWER MODEL
ESTIMATED VAPOR CONCENTRATIONS

CHEMICAL	MASS TRANSFER EFFICIENCY	SHOWER VAPOR CONCENTRATION (ug/m^3)
VOLATILE ORGANICS		
ACETONE	0.38	1.6E+01
BENZENE	0.53	2.1E+02
2–BUTANONE	0.18	1.5E+00
1,1–DICHLOROETHANE	0.49	4.7E+01
1,1–DICHLOROETHENE	0.50	1.9E+01
1,2–DICHLOROETHENE	0.50	1.6E+04
FREON 113	0.40	1.8E+03
METHYLENE CHLORIDE	0.52	2.2E+02
TETRACHLOROETHENE	0.42	8.0E+02
TOLUENE	0.51	3.6E+01
1,1,1–TRICHLOROETHANE	0.45	2.1E+04
TRICHLOROETHENE	0.45	1.2E+05
VINYL CHLORIDE	0.56	8.5E+03
SEMIVOLATILE ORGANICS		
2–METHYLPHENOL	0.03	5.7E–01
4–METHYLPHENOL	0.02	1.7E–01
DIETHYLPHTHALATE	0.01	4.9E–01
DI–N–BUTYLPHTHALATE	0.03	4.1E–01
BIS(2–ETHYLHEXYL)PHTHALATE	0.11	4.5E–01