HILLSIDE SCHOOL

PRE-FEASIBILITY STUDY ENVIRONMENTAL EVALUATION

TOWN OF NEEDHAM – PUBLIC SCHOOLS
NEEDHAM, MASSACHUSETTS

HILLSIDE ELEMENTARY SCHOOL

FINAL REPORT

5 OCTOBER 2012

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Acknowledgements

Needham Public Schools and Town of Needham

Dore & Whittier Architects, Inc. would like to acknowledge the following individuals for their dedication to the Town of Needham and for their assistance to the Design Team.

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Section B

INTRODUCTION & BACKGROUND

Overview

The goal of the Pre-Feasibility Study (July 6, 2012) was to closely review and determine possible long-term solutions or options for the Hillside and Mitchell Elementary Schools. This report, *The Environmental Evaluation of the Hillside School Site*, is a further look at the particular site conditions that exist on the Hillside site due to the TCE chemicals found in the groundwater, and will assist in determining the feasibility of the design options presented in the previous report concerning development on the Site. This report is intended to supplement the previous reports and assist the Town of Needham in its preparation of a Statement of Interest (SOI) for the Massachusetts School Building Authority (MSBA).

Dore & Whittier, with the permission of the Town of Needham, consulted with Lord Associates to develop this environmental evaluation. Lord Associates was chosen to assist in this task due to their extensive knowledge of the Microwave Development Laboratories (MDL) site (the source of contamination) and the Hillside School site. Lord Associates has been working with MDL and the Department of Environmental Protection in the testing and evaluation of each of the sites affected by the chemicals.

Site cost estimates were developed based on the three options for the Hillside School site presented in the Pre-Feasibility study, which are:

- additions and renovations to the existing school;
- construction of a new school on the existing site and the removal of the existing school;
- relocation of the Hillside School and repurposing of the Hillside site for sports fields.

Additional information and diagrams of these options can be found in the Pre-Feasibility report dated July 6, 2012.

Section C

EXECUTIVE SUMMARY

The Pre-Feasibility Study (dated July 6, 2012) that preceded this report was a comprehensive study of the existing conditions and possible design options for the Hillside and Mitchell Elementary Schools. The potential Hillside options outlined in that study include; additions and renovation to the existing Hillside School, construction of a new school on the Hillside site, and relocation of the Hillside School to another site creating the opportunity to develop playfields on the Hillside site. Each option has both opportunities and constraints.

The Hillside School site conditions are unique. In addition to its sloped landscape, high water table and extensive wetlands, a 1980s off-site chemical spill upgradient of the school site has required that the site and the school building be consistently monitored for chlorinated hydrocarbon trichloroethene (TCE) and its byproduct tetrachloroethene (PCE).

The chemical TCE originates at the Microwave Development Laboratory, Inc. (MDL) property (see map below). Since identification of TCE in the indoor air of the school, a sub-slab depressurization system (SSD) of under-slab venting and monitoring has been in place. Air quality monitoring has indicated that over the years, this system has been effective in eliminating the intrusion of vapors into the school environment.

The on-site groundwater cleanup has been less effective over time. Per the Department of Environmental Protection (DEP), the concentrations of contaminated groundwater on the Hillside site remains above applicable standards. Test wells were installed on the Hillside site, at the source site and at other properties affected by the chemical spill. The monitoring of most of these wells indicates that over the last 12 years there has been a significant improvement to the quality of the groundwater. However, while the wells located up gradient (east) of the school show a decreasing trend, those located down gradient (west) indicate an increase in the shallow well and no significant change in the deeper well. In 2010, additional wells were installed on the Hillside School site to further investigate these conditions. Results from the sampling of the new wells in August 2012 indicate the levels of TCE remain above DEP allowable standards.

Per the DEP, the Hillside School Site is considered to be in Phase III of a five-phase investigation and cleanup process. An outline of the five phases is as follows:

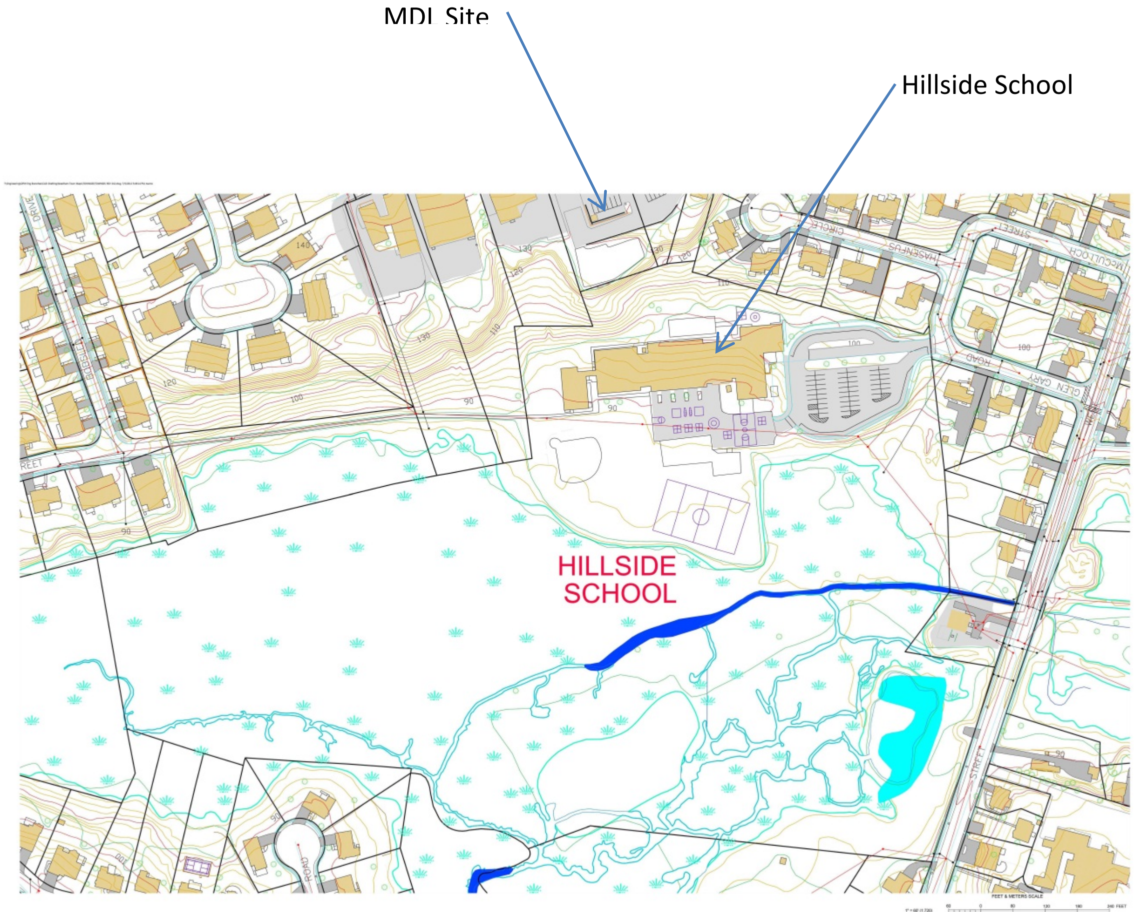
Phase I: Investigation
Phase II: Comprehensive assessment
Phase III: Identifications of remedial alternatives

Phase IV: Implementation of remedy
Phase V: Operation and maintenance

Full remediation of the Hillside site is difficult due to the ongoing use of the site as an elementary school and because the highest level of concentration of contaminated ground water is located underneath the building. Recommendations for alternate methods of remediation were submitted to the DEP in 2011, and their implementation is awaiting the Town's decision regarding the school / site development, as it may be most effective to coordinate remediation with any proposed construction.

The Hillside School design options vary in the amount of site work required, however each option requires some level of disruption of the existing soils and the hillside. To date, the testing of soil samples has been limited, and the soils that have been tested have fallen below the maximum allowable TVOC (total volatile organic compounds) allowed for disposal in a Massachusetts lined landfill site. The cost outlined in the report assumes that the Hillside soil will be accepted in a state landfill and additional mitigation will not be required. However, due to the limited testing, the true level of soil contamination is unknown. Should further soil testing indicate a level of contamination that's above the level accepted by the state landfills, soils will need to be remediated on-site. The options for this remediation will vary depending on the level of contamination, stock piling, spreading the soil on-site, or on-site pug milling (soil agitation) are possible options for on-site remediation. The cost associated with treating soils on-site is not included in the estimates provided. An additional cost of approximately $70 per ton should be added to the estimates if it is determined that the soils require on-site treatment. The current estimate for the transport and disposal of the soil is $191,000-$348,000 per the Lord Associates report. Increasing the cost per ton for on-site remediation of soil will significantly increase those estimates to a range of $764,000 – $1,160,000.

The existing school uses a crawl space ventilation and a sub slab depressurization system which is regularly monitored and tested, thus adding to the operational cost of the facility. The cost of a installing a similar system has been factored into the estimated design cost of the Hillside School options. Alternative methods, new technologies or other building solutions may exist and be applicable solutions for new construction. One such method is an interceptor trench or barrier, or impervious membrane which may reduce the need for continued monitoring and operation of the depressurization system. Additional methods for complete site remediation can be explored, such as chemical injection or oxidation and, if found successful, could remove the environmental risk of TCE or PCE containments in the groundwater, soil, and air in and around the Hillside School site.



Maps showing the TCE concentrations and the limits of the plume are available at the Needham Public Library or through the MA DWP.

Section D

Prefeasibility Environmental Evaluation for Hillside School Property

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Project No. 1904

September 20, 2012

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I. Introduction and Background

As part of The Town of Needham's master planning process, it has contracted with the architectural firm Dore and Whitter Architects, Inc., to complete a Prefeasibility Study for redevelopment considerations of the Hillside Elementary School located at Glen Gary Drive. Alternatives under consideration for the school include:

- Addition/renovation of existing school;
- Demolition and construction of a new school on a new footprint on the site, and
- Demolition and construction of new sports fields on the site.

Because the property on which the Hillside School is located within the boundaries of a state-listed priority disposal site (RTN 3-0386), Lord Associates, Inc. (LAI) was tasked with summarizing the subsurface environmental conditions at the property relative to the proposed redevelopment alternatives and implications for construction and future management of systems within the school to prevent exposure to environmental contaminants.

Environmental contaminants of concern present in groundwater and soil at the subject property include the chlorinated hydrocarbon trichloroethene (TCE) and its various breakdown products. The source of the TCE originates at property located on Crescent Road owned by the Microwave Development Laboratory, Inc. (MDL) approximately 500 feet to the east of the school.

Since the identification of TCE in indoor air at the school in 1989, systems have been in-place that are designed to prevent the intrusion of vapors from the subsurface into the school and eliminate exposure to students and faculty. Regular monitoring of indoor air quality for the past 23 years indicates that the system has been successful in meeting this goal.

While site conditions have greatly improved at the source areas and other locations upgradient of the school, concentrations remain above applicable Department of Environmental Protection (DEP) groundwater cleanup standards at the school property. As these conditions are likely to continue to persist for some time, any proposed change in future activity and use needs to be evaluated relative to environmental risk.

II. Site Status

There are five phases of investigation and cleanup under the Massachusetts Contingency Plan regulations at 310 CMR 40.0000. Phase I is the initial site investigation phase, under which sufficient information is gathered to identify a release to the environment and begin assessing the degree of risk that conditions represent to human health, safety, public welfare and the environment. Phase II is where a comprehensive assessment of the site is made, defining the nature and extent of contamination as well characterizing the significance of potential risk of harm. Phase III is the identification of remedial alternatives, and Phase IV is the plan to implement the remedy. Phase V is the operation and maintenance of the remedy.

The DEP considers the Hillside School Area to be within Phase III. These regulations (310 CMR 40.0852) require that a Phase III Remedial Action Plan results in the selection of a remedial action alternative which is a likely Permanent Solution, except where it is demonstrated that a Permanent Solution is not feasible or that the implementation of a Temporary Solution would be more cost-effective and timely than the implementation of a feasible Permanent Solution.

A Focused Phase III Remedial Action Plan (RAP) was prepared by Shaw Environmental, Inc. on behalf of Massachusetts Department of Environmental Protection (DEP) dated February 18, 2004 that identified In-Situ Chemical Oxidation (ISCO) as the preferred remedial alternative to address the "source areas" on the MDL property. A program to implement this solution was proposed by Lord Associates, Inc. on behalf of MDL in the May 24, 2010 Phase IV Remedy Implementation Plan (RIP). The RIP was implemented in October of 2010, and is on-going.

To address conditions at the Hillside School and Hasenfus Circle areas of the Site, the Phase III RAP identified two potentially feasible alternatives: continued operation of the active sub-slab depressurization systems (SSDs), and the installation of permeable reactive barriers. The Continued operation of the SSDs was recommended as the preferred option due to cost considerations.

The SSDs installed at the school were designed to prevent indoor air exposure to site contaminants by intercepting site contaminants that volatilize from groundwater to soil vapor beneath the building. Their design is not intended to remediate (clean-up) the source of the contamination. While these systems have demonstrated their effectiveness in preventing exposure to site contaminants since their installation in 1989, it was recognized that the concentrations of TCE in groundwater in monitoring wells MW-10 and MW-11D located west of the school has not changed significantly in the past ten years. On February 1, 2010, the DEP issued a Phase III Approval letter to MDL for source control measures that included a requirement to re-visit the evaluation of potential remedial solutions for the Hillside School area.

As described in Lord Associates May 24, 2010 Phase IV Remedy Implementation Plan prepared for the source area on MDL property, there had not been any feasibility or pilot testing of remedial technologies at the Hillside School area of the Site to-date. Factors that make a straight-forward remedial approach difficult to implement at the Hillside School area of the Site include:

- Limited access, as the current use is an elementary school;
- Location of the highest concentrations are underneath the school;

- Limited space upgradient of the school, as the hill grade rises significantly from within a few feet of the school's east side to the wooded areas up to Crescent Road;
- Dense (low conductivity) soil types;
- High groundwater elevations; and
- Potential high natural Soil Oxidant Demand ("SOD").

For these reasons, additional testing was completed at the school in 2010 to better understand the physical chemistry of groundwater, soil oxidant demand, hydraulic conductivity, biologic activity, and other parameters such as oxidation/reduction potential (ORP) and pH that will affect the selection of the remedial approach for this area.
A Draft Phase III Plan was submitted to the DEP in 2011 that identified targeted in-situ chemical oxidation and continued SSD with monitored natural attenuation as feasible solutions. However, it was also recommended that implementation of these alternatives be delayed pending the Town's decision regarding school redevelopment. It is recognized that timing of the implementation of a remedy with the construction process may be advantageous.

II. Site Conditions

2.1 Hydrogeology

The Hillside School was constructed in 1960. As the name implies, it was constructed on the west side of the base of a hill which rises to an elevation approximately 60 feet higher than the school property (see **Figure 1**). To construct the school property, an area of wetlands was filled-in and brought to grade to form the athletic fields west of the building. The school building itself was constructed on glacially derived deposits of silt, sand, gravel, and clay materials in the form of a well compacted basal till. A veneer of glacial outwash, deposited immediately above the till surface has been noted in several areas on the hillside, and extends in thickness at the base of the hill out across Rosemary Meadow to the West. In addition, a layer of fill/reworked till immediately below grade was noted in the developed portions of the site[1].

Bedrock in the area has been classified as a meta-volcanic rhyolite schist of the Mattapan Volcanic Complex. A bedrock "trough" was described as beginning at the base of the hill near the school running east to west. At this location, the southern wall of the trough drops from an elevation of approximately 173 feet MSL at MW-11D to an elevation of 148 feet MSL at MW-27D, and then rises up to the northern wall to an elevation of approximately 167 feet MSL at CW-2.

Two new wells ("LB-1/MW" & "LB-2/MW"), were installed at the school in 2010 to fill-in data gaps regarding shallow groundwater conditions. The new well locations were selected to be representative of conditions at the northeast side of the school building

[1] Final Phase II Comprehensive Site Assessment. Cygnus Group, Inc. June 30, 2000

upgradient of wells MW-10 & MW-11D, and in the shallow aquifer near MW-28S and MW-29D (see **Figure 2**).

The soil types identified during the installation of the new wells were consistent with those previously mapped for the Phase II Comprehensive Site Assessment (CSA) in 2000. Approximately ten feet of very dense coarse gravelly sand overlies very dense gray silty sand to the north of the school. Similar stratigraphy is found to the east of the north end of the school, with the silty sand being encountered at a shallower (approx. 5 feet) depth. Copies of the boring logs for the new wells as well as all others at the school, and a copy of the cross section plan drawn through this area of the Site for the 2000 Phase II CSA are provided in **Appendix A**.

To estimate the hydraulic conductivity of the soils at the new boring locations, single well steady-state pumping tests were conducted at wells LB-1/MW and LB-2/MW. The method used was developed by Dr. Gary Robbins at the University of Connecticut. Using this method, the hydraulic conductivity was estimated at 7.2×10^{-3}cm/s at well LB-1/MW. The tests could not be completed at LB-2/MW due to insufficient water recharge. Earlier packer testing completed on school property at well MW-27D indicate a calculated hydraulic conductivity of 2.10×10^{-7} cm/s at a depth of 49 to 50 ft. below surface grade (bsg); 6.94×10^{-7} cm/s at a depth of 59-64 ft bsg; and 1.54×10^{-6} cm/s at a depth of 69 to 74 ft bsg[2].

These results indicate that the shallow overburden gravelly sandy soils are more permeable than the deeper silty sands. However, both soil types are noted as “very dense”, and wells sampled in this area exhibit slow recharge.

A record of the depth to groundwater within the groundwater monitoring wells at the school has been kept since their installation for each sampling event (see **Table 1** following text). These data indicate that the depth to groundwater varies a few feet seasonally, with the highest elevations being recorded in the spring. The depth to groundwater is shallowest on the east side of the school where it may be found within a few feet of the surface.

A groundwater seep is observed each spring near the toe of the slope behind the school to the east. A catch basin was installed at this location to divert the flow away from the school to the downgradient wetlands. Groundwater may be observed running into this flow structure all year. Calculations of vertical groundwater gradient were made in the June 2000 Phase II Comprehensive Site Assessment Report that indicated that there was a downward gradient at the top of the hill all the way to the Hillside property. At the school property, the vertical gradients become shallower, and exhibit pronounced seasonal and weather dependent elevations.

The depth to groundwater on the west side of the school is deeper, typically within 5 feet of the surface. Groundwater infiltration into the utility crawlspaces and subgrade spaces has been a continual problem since construction of the school.

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[2] Table 5, Final Phase II Comprehensive Site Assessment Report, June 30, 2000 by Cygnus Group, Inc.

2.2 Groundwater Quality

The primary contaminant of concern identified in groundwater on the school property is trichloroethene (TCE). Lesser concentrations of tetrachloroethene (PCE) and degradation products of TCE have also been detected; however, the primary concern for potential vapor intrusion into the school building has been TCE. Extensive monitoring of groundwater for these contaminants has taken place at this and other locations of the Site since the late 1980's.

Since the implementation of remedial activities at the "source areas" upgradient of the school, significant improvements in groundwater quality have been achieved. Current sampling data indicates that all remedial objectives set for TCE have been met, and a sampling program has been implemented to monitor conditions for potential "rebound" effects, as well as changes in downgradient water quality.

An assessment of groundwater conditions at downgradient monitoring wells between Crescent Road and the Hillside School over the last twelve years indicates that there have also been significant improvements in TCE concentration. As shown in the following **Table 2**, concentrations of TCE have decreased by greater than 70% during this time period in the "deeper" (>20'bsg) aquifer.

Table 2
Summary of TCE Concentrations (in ug/L) in "Deep" Wells between Crescent Road and Hillside School

Well ID	Location	Jun-00	Jun-12	% change
B-46D	140 Crescent Road	330	66	80.0
B-38D	124 Crescent Road	1,390	420	70.0
MW-14D	140 Crescent Road	2,600	2.7	99.0
B-28D	140 (rear) Crescent Road	2,775	24	99.0
B-42D	124 (rear) Crescent Road	2,638	190	93.0
B-44D	Hillside School	2,325	380	84.0

An assessment of TCE concentrations in groundwater at wells located on Hillside School property north and west of the school, do not show much improvement over that same time period. While wells located directly upgradient (east) of the school show a decreasing trend, the couplet MW-10 and MW-11D located downgradient (west) of the school actually indicate an increase in the shallow well, and no significant change in the deeper well. A summary of the annual data collected at these wells is provided as **Table 3** and graphed on **Figure 3**.

Sampling of the two new wells installed in the shallow aquifer north (LB-1/MW) and east (LB-2/MW) in August of 2012 resulted in detections of TCE at concentrations of 310 and 74 micrograms per liter (ug/L[3]), respectively. Both of these results exceed the applicable MCP Method 1 GW-2 groundwater cleanup standard set for TCE at 30 ug/L. Note that the site-specific risk characterization completed for the school in June 2000 identified a groundwater remedial objective of 50 ug/L for TCE.

These data indicate that the activities completed at the source areas have yet to result in a marked change in TCE concentrations at the base of the slope of the hill where the Hillside School is located. This may be explained by the low hydraulic conductivity soils which result in relatively long travel time estimates from the source areas to the school. Prior studies estimated these to be in excess of ten years[4]. As the gradient flattens out at the school, the travel time would decrease further.

2.3 Soil Quality

With few exceptions, the sampling and analyses of soil samples has been limited to the headspace screening of soil collected during test borings for total volatile organic compounds (VOCs) with a hand-held photoionization detector. These data indicate that soil is not impacted until it is in contact with contaminated groundwater in the saturated zone. A few samples collected within the top two feet of the surface at the Hillside School in preparation of the construction of modular classrooms were analyzed by a state-certified lab. These data did not indicate the presence of VOCs.

At the "source" area of the former cesspools on MDL property, the maximum recorded TCE detection in soil was 4.2 milligrams per kilogram (mg/Kg). Note that these samples were collected without the use of methanol preservative as is now required, therefore the results may be considered to be biased low. For comparison purposes, the most stringent TCE soil cleanup standard applicable for the Site, S-1/GW-1 is 0.3 mg/Kg, and the S-1/GW-2 standard is 2 mg/Kg. The maximum concentration for TVOC disposal in a lined landfill in Massachusetts is 10 mg/Kg. Additional testing of soil for VOCs is not planned.

III. Cost Considerations of Redevelopment Alternatives

Each of the proposed redevelopment alternatives involves some expansion to the east into the slope of the hill. Copies of the preliminary architectural drawings are provided in **Appendix B**. Excavation into the slope will encounter contaminated groundwater within a few feet of the surface (pending seasonal fluctuations). Water saturated soil with some

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[3] The unit micrograms per liter (ug/L) is roughly equivalent to parts per billion (ppb). A part per million (mg/L), is 1000 times greater than a ug/L.
[4] Final Phase II Comprehensive Site Assessment Report. MDL, prepared by the Cygnus Group, Inc., June 30, 2000.

degree of site contamination will also be encountered. Given these conditions, there must be design consideration for 1)groundwater management , 2) soil disposal options, and 3) new design features for the prevention of vapor intrusion.

1. Groundwater/Surface water Management

Expansion into the shallow water table will require the new design to incorporate a system to intercept and divert the flow to the adjacent wetlands. At present, three catchbasins are located on the east side of the school which are designed to collect surface water and divert it to an outfall located behind the ball field to the north in the adjacent wetlands. Groundwater may be observed seeping into the basins on a continual basis throughout the year. As analyses of this groundwater at the outfall in the past showed relatively low TCE concentrations (approx. 30 ug/L), no treatment has been required prior to discharge to the adjacent wetlands.

Despite this collection and diversion system, the school periodically experiences flooding conditions in the utility crawlspaces and subgrade furnace room. In the past, groundwater has also infiltrated the foundation wall of the rooms located on the first floor.

The new design options will need to include a replacement for this catchbasin system. An improved design should be used that will purposefully intercept groundwater at the elevation of the new foundation and divert it to the wetlands. Costs for the design and installation of a new catchbasin system are estimated at $60,000.

In addition to the long-term management of groundwater and surface water, during active excavation, provisions will need to be made to control infiltrating groundwater. The permitting and installation of a dewatering system including fractionation tank is estimated at $30,000. Rental and monitoring expenses are dependent on the length of time the excavation is open. For estimation purposes, we have considered a 3-9 month operating period at a cost of $56,000-128,000.

2. Soil Disposal Options

Soil excavated from the hillside will require testing for VOCs and segregation based on the concentrations detected for off-site disposal. Based on the nature of the contaminant, it is not likely that soil concentrations will exceed the in-state lined landfill disposal standard of 10 mg/Kg total VOCs. Therefore special treatment prior to off-site landfill disposal is not likely to be required.

Each of the three redevelopment options requires some soil excavation. Approximate areas affected, estimated soil volumes displaced, and landfill disposal costs are summarized below.

Table 4
Summary of Soil Excavation Cost Estimates

Option:	Area ft^2	Depth ft	Depth ft	Volume ft^3	Volume ft^3	yd^3	yd^3	ton	ton	10% contingency	10% contingency	$ at 25 ton	$ at 25 ton	$ at 30 ton	$ at 30 ton
Addition/Renovation															
East Side	15,000	4	5	60,000	75,000	2,222	2,778	3,333	4,167	3,666.7	4,583.3	$ 91,667	$ 114,583	$ 110,000	$ 137,500
North Side	10,000	4	5	40,000	50,000	1,481	1,852	2,222	2,778	2,444.4	3,055.6	$ 61,111	$ 76,389	$ 73,333	$ 91,667
												$152,778	$ 190,972	$ 183,333	$ 229,167
New Construction	38,000	4	5	152,000	190,000	5,630	7,037	8,444	10,556	9,288.9	11,611.1	$232,222	$ 290,278	$ 278,667	$ 348,333
Athletic Field Use	47,000	3	4	141,000	188,000	5,222	6,963	7,833	10,444	8,616.7	11,488.9	$215,417	$ 287,222	$ 258,500	$ 344,667

As shown, these design options potentially would require between 6,000 and 12,000 tons of soil to be disposed of off-site. Transport and disposal at a state-approved lined landfill could cost between $191,000 to $348,000.

Additional expense related to the on-site monitoring, lab testing, and planning could add an additional $25,000 to $30,000, for a total soil excavation cost estimate between $216,000-$378,000.

3. Mitigation of Vapor Intrusion

The system the school currently uses to mitigate vapor intrusion consists of a crawlspace ventilation system and a subslab depressurization system. The crawlspace system ventilates the existing utility tunnels. The subslab system utilizes multiple collection points throughout the school to depressurize the slab. As the data indicates, groundwater conditions in excess of the cleanup standard designed to be protective of indoor air issues are likely to persist for some time well into the design life of the new building. Consequently, the new design will need to feature provisions to replace these vapor intrusion mitigation systems.

Such design features should include an impervious membrane or barrier coating on the concrete foundation slab and walls, and soil gas collection points beneath the slab that may be re-activated with powered blowers if testing indicates that the membrane is not effective. The expanded footprint of the building under the renovation and new construction options would likely require an expanded system, adding to the operation and maintenance costs. Under the athletic field construction scenario, a field house building would be constructed. Although occupancy inside the field house is anticipated to be of short duration, to be conservative, construction should include the installation of a vapor barrier. Installation of a sub-slab depressurization system will not likely be necessary, but is considered.

A summary of the areas requiring membrane installation, SSD installation and approximate costs are provided in the following table.

Table 5
Summary of Vapor Mitigation Cost Estimates

Option:	Area ft^2	Membrane Installation @$1/sf	@5/sf	SSD Installation	Total Vapor Mitigation	
Addition/Renovation	25,000	$ 25,000	$ 125,000	$ 10,000	$ 35,000	$ 135,000
New Construction	38,000	$ 38,000	$ 190,000	$ 15,000	$ 53,000	$ 205,000
Athletic Field Use	2,500	$ 2,500	$ 12,500	$ 2,500	$ 2,500	$ 15,000

Annual operation and maintenance costs would be approximately the same as the current system assuming the crawlspace ventilation system would be eliminated and a similar monitoring plan implemented. At present, these costs approximate $25,000, annually for which MDL is responsible.

A summary of the total cost estimates for each of the redevelopment options follow. Note that these are 2012 cost numbers. An escalation factor between 3-5% per year should be considered for future planning purposes.

Table 6
Summary of Total Remedial Cost Estimates Associated with Redevelopment Options

Option	Remediation	Cost Estimate	Sub Total
Addition/Renovation	Groundwater Mgmt.	$116,000-188,000	
	Soil Disposal	$183,000-259,000	
	Vapor Mitigation	$35,000-135,000	$334,000-582,000
New Construction	Groundwater Mgmt.	$116,000-188,000	
	Soil Disposal	$262,000-378,000	
	Vapor Mitigation	$53,000-205,000	$431,000-771,000
Athletic Field Use	Groundwater Mgmt.	$116,000-188,000	
	Soil Disposal	$245,000-375,000	
	Vapor Mitigation	$2,500-15,000	$363,500-578,000

FIGURES

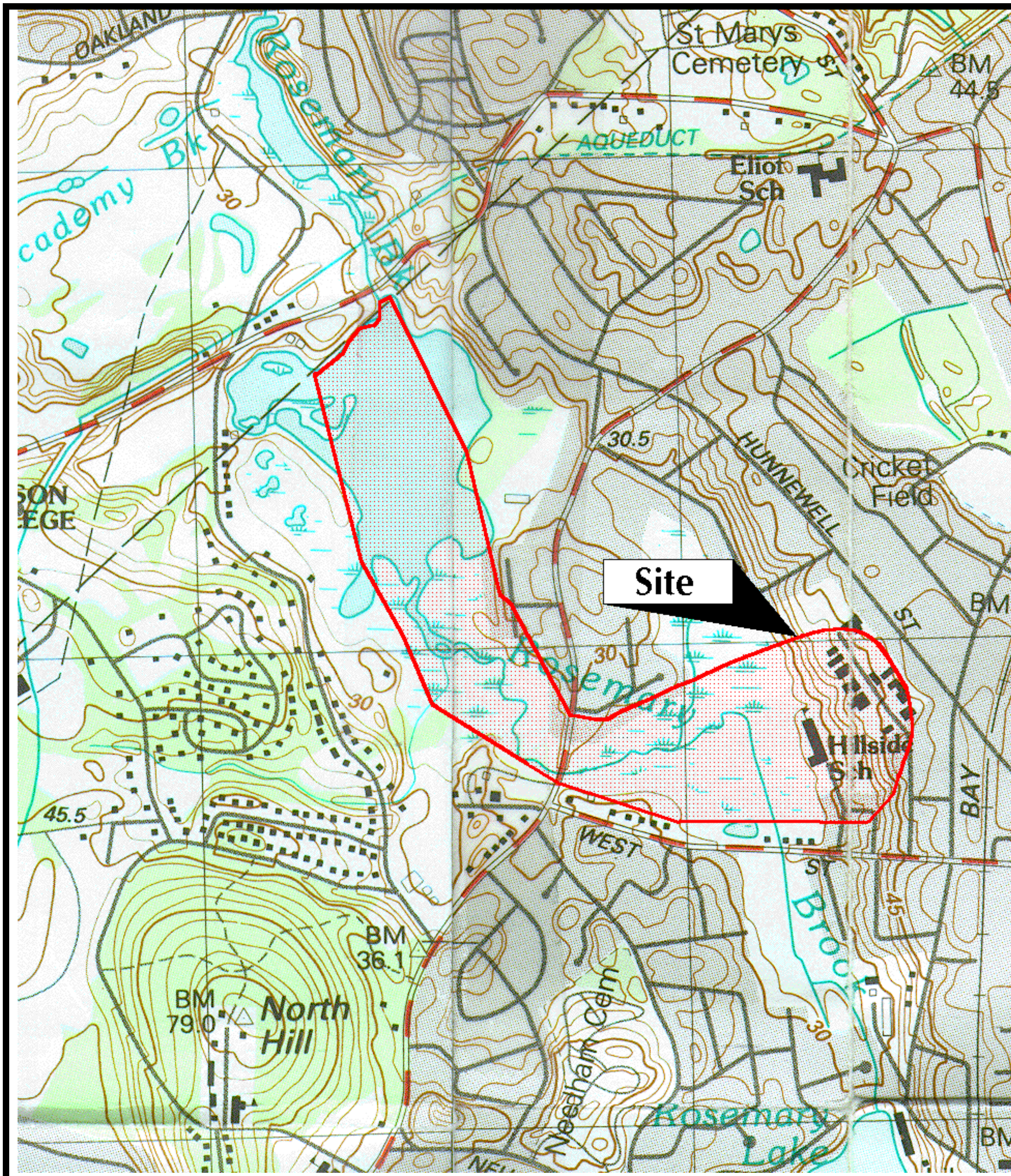
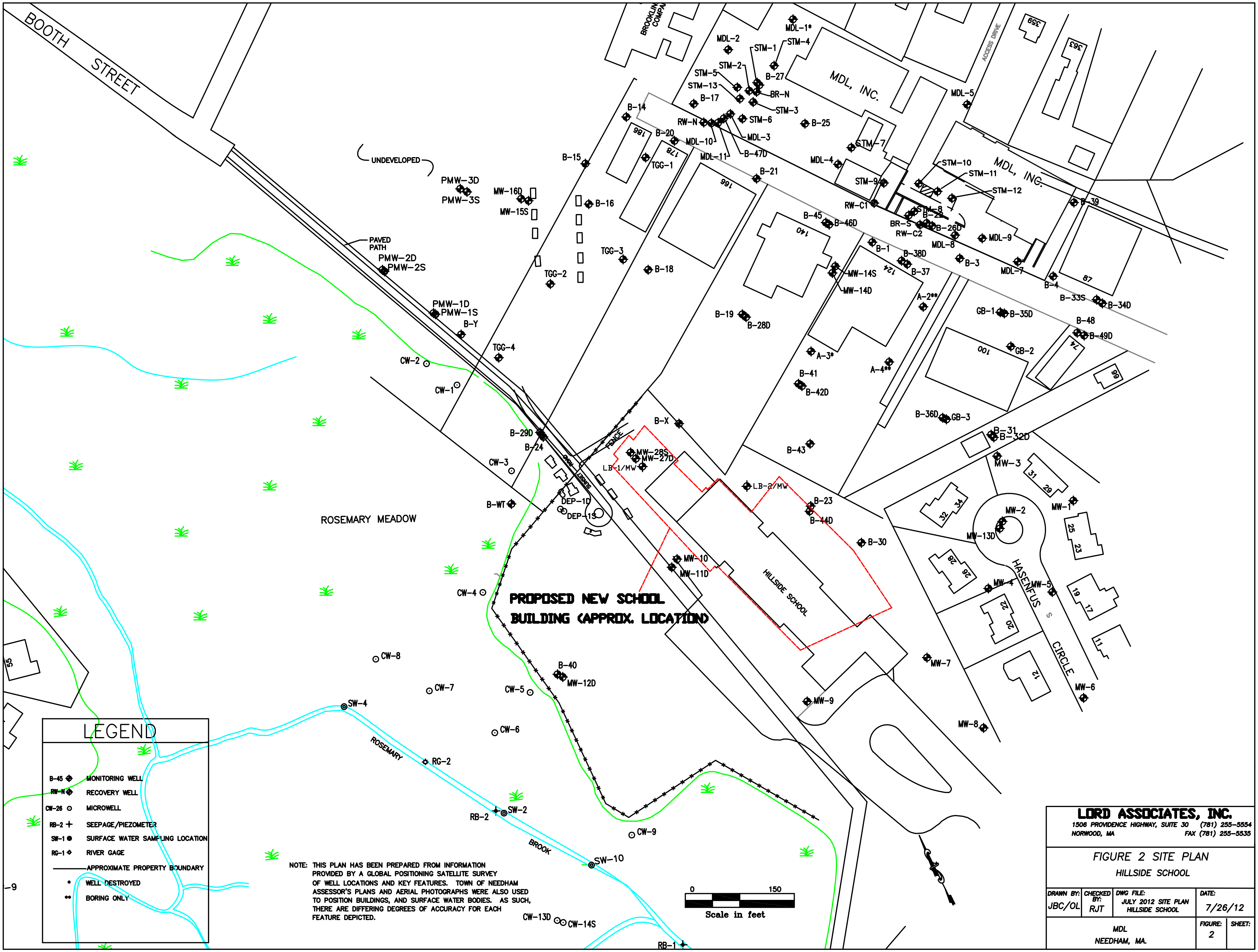


FIGURE 1	**Lord Associates, Inc.**
Site Locus	
Microwave Development Laboratories, Inc. Site 101-145 Crescent Road, Needham, MA	1506 Providence Highway, Suite 30
Scale 1" ≈ 1042'	Norwood, MA. 02062


BOOTH STREET
UNDEVELOPED
PAVED PATH
ROSEMARY MEADOW
PROPOSED NEW SCHOOL
BUILDING (APPROX. LOCATION)
HILLSIDE SCHOOL
MDL, INC.
MDL, INC.
ACCESS DRIVE
HASENFUS CIRCLE
ROSEMARY BROOK
SUNSET ROAD
FENCE
PMW-3D
PMW-3S
PMW-2D
PMW-2S
PMW-1D
PMW-1S
MW-16D
MW-15S
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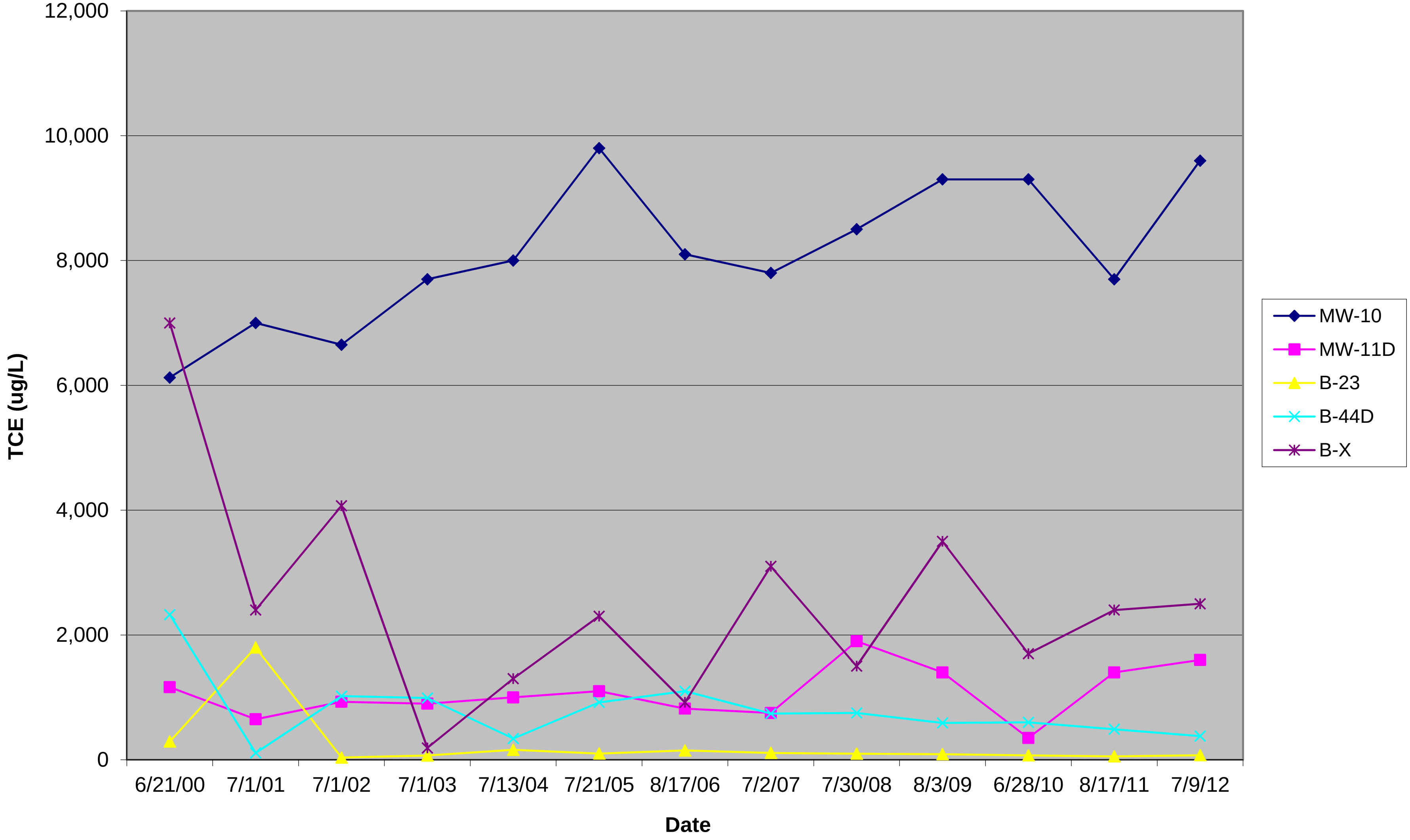
B-15
B-16
B-14
B-20
B-17
B-18
B-19
B-28D
B-21
B-45
B-46D
B-1
B-38D
B-37
B-3
B-4
B-33S
B-34D
B-35D
B-48
B-49D
B-39
B-25
B-27
B-47D
B-41
B-42D
B-43
B-36D
B-31
B-32D
B-X
B-23
B-44D
B-30
B-29D
B-24
B-WT
B-40
B-26D
B-22
A-2**
A-3*
A-4**
GB-1
GB-2
GB-3
TGG-1
TGG-2
TGG-3
TGG-4
CW-1
CW-2
CW-3
CW-4
CW-5
CW-6
CW-7
CW-8
CW-9
CW-13D
CW-14S
DEP-1D
DEP-1S
MW-28S
MW-27D
LB-1/MW
LB-2/MW
MW-10
MW-11D
MW-12D
MW-14S
MW-14D
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9
MW-13D
MDL-1*
MDL-2
MDL-3
MDL-4
MDL-5
MDL-7
MDL-8
MDL-9
MDL-10
MDL-11
STM-1
STM-2
STM-3
STM-4
STM-5
STM-6
STM-7
STM-8
STM-9
STM-10
STM-11
STM-12
STM-13
RW-N
BR-N
RW-C1
RW-C2
BR-S
SW-2
SW-4
SW-10
RG-2
RB-1
RB-2
BROOKLINE COMPA
55
186
178
166
140
124
100
87
74
66
359
363
31
29
32
34
25
23
26
28
20
22
19
17
11
12
LEGEND
B-45 MONITORING WELL
RW-N RECOVERY WELL
CW-26 MICROWELL
RB-2 SEEPAGE/PIEZOMETER
SW-1 SURFACE WATER SAMPLING LOCATION
RG-1 RIVER GAGE
APPROXIMATE PROPERTY BOUNDARY
* WELL DESTROYED
** BORING ONLY
NOTE: THIS PLAN HAS BEEN PREPARED FROM INFORMATION PROVIDED BY A GLOBAL POSITIONING SATELLITE SURVEY OF WELL LOCATIONS AND KEY FEATURES. TOWN OF NEEDHAM ASSESSOR'S PLANS AND AERIAL PHOTOGRAPHS WERE ALSO USED TO POSITION BUILDINGS, AND SURFACE WATER BODIES. AS SUCH, THERE ARE DIFFERING DEGREES OF ACCURACY FOR EACH FEATURE DEPICTED.
0
150
Scale in feet
LORD ASSOCIATES, INC.
1506 PROVIDENCE HIGHWAY, SUITE 30 (781) 255-5554
NORWOOD, MA FAX (781) 255-5535
FIGURE 2 SITE PLAN
HILLSIDE SCHOOL
DRAWN BY: JBC/OL
CHECKED BY: RJT
DWG FILE: JULY 2012 SITE PLAN HILLSIDE SCHOOL
DATE: 7/26/12
MDL
NEEDHAM, MA.
FIGURE: 2
SHEET:

Figure 3: TCE in Hillside School Wells Over Time



TABLES

Table 1
Groundwater Elevations
Cresent Road Site, Needham, MA

SURVEY POINT	RIM ELEV. (ft.)	Oct-99 ELEV. (ft.)	Jan-00 ELEV. (ft.)	Apr-00 ELEV. (ft.)	Jul-00 ELEV. (ft.)	Oct-00 ELEV. (ft.)	Jan-01 ELEV. (ft.)	Apr-01 ELEV. (ft.)	Jul-01 ELEV. (ft.)	Oct-01 ELEV. (ft.)	Jan-02 ELEV. (ft.)	Apr-02 ELEV. (ft.)	Jul-02 ELEV. (ft.)	Oct-02 ELEV. (ft.)	Jan-03 ELEV. (ft.)
MDL-2	260.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-3	254.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-4	256.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-5	271.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-7	259.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-9	259.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-10	252.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-11	252.30	NA	236.37	244.08	235.80	232.50	NA	244.14	237.10	231.67	230.08	237.61	236.64	NA	NA
GB-1	255.80	NA	NA	NA	247.47	NA	NA	NA	247.39	NA	NA	NA	NA	NA	NA
GB-2	254.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GB-3	248.70	NA	NA	NA	229.90	NA	NA	NA	230.31	NA	NA	NA	NA	NA	NA
GT-1D	198.75	NA	189.19	189.21	187.99	188.95	189.01	188.70	NA	188.88	NG	189.30	NA	NA	NA
GT-2I	198.84	NA	189.11	189.09	188.44	188.85	189.84	189.63	NA	188.90	NG	189.33	NA	NA	NA
GT-3D	197.15	NA	NA	NA	188.42	NA	NA	NA	189.07	NA	NA	NA	NA	NA	NA
GT-4I	197.06	NA	NA	189.12	188.57	NA	NA	NA	189.06	NA	NA	NA	NA	NA	NA
B-1	252.98	NA	NA	NA	245.28	NA	NA	NA	245.03	NA	NA	NA	NA	NA	NA
B-3	255.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	260.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-14	248.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-15	242.54	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-16	238.81	NA	NA	NA	227.86	NA	NA	NA	227.61	NA	NA	NA	227.53	NA	NA
B-17	253.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-18	239.73	NA	NA	NA	220.58	NA	NA	NA	220.23	NA	NA	NA	220.68	NA	NA
B-19	237.42	224.44	225.08	226.23	225.79	223.02	226.48	227.28	225.55	223.21	221.44	NA	NA	NA	NA
B-20	249.70	NA	NA	NA	237.00	NA	NA	NA	235.7	NA	NA	NA	NA	NA	NA
B-21	250.00	NA	NA	NA	237.95	NA	NA	NA	236.58	NA	NA	NA	NA	NA	NA
B-22	254.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-23	206.70	204.92	204.58	204.95	204.35	197.37	204.51	NA	199.18	NA	205.02	204.76	204.73	205.27	204.81
B-24	193.50	NA	NA	NA	189.93	NA	NA	NA	189.68	NA	NA	NA	NA	NA	NA
B-25	257.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-26D	254.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-27	257.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-28D	237.43	218.01	218.55	219.7	218.95	217.17	196.43	221.89	225.13	216.80	216.26	218.95	218.45	217.12	219.36
B-29D	193.60	NA	NA	NA	191.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-30	208.60	NA	NA	NA	202.61	NA	NA	NA	202.45	NA	NA	NA	NA	NA	NA

Notes: NA- Not Available; NI- Not installed; * Artesian effects noted at MW-25D and MW-26S; [a]Gauged on 12/2/97.
Wells without shown rim elevation are reported at depth to GW, not GW elevation

Table 1
Groundwater Elevations
Cresent Road Site, Needham, MA

SURVEY POINT	RIM ELEV. (ft.)	Oct-99 ELEV. (ft.)	Jan-00 ELEV. (ft.)	Apr-00 ELEV. (ft.)	Jul-00 ELEV. (ft.)	Oct-00 ELEV. (ft.)	Jan-01 ELEV. (ft.)	Apr-01 ELEV. (ft.)	Jul-01 ELEV. (ft.)	Oct-01 ELEV. (ft.)	Jan-02 ELEV. (ft.)	Jan-02 ELEV. (ft.)	Jul-02 ELEV. (ft.)	Oct-02 ELEV. (ft.)	Jan-03 ELEV. (ft.)
B-31	251.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-32D	251.30	233	NA	NA	231.64	NA	NA	NA	231.8	NA	NA	NA	239.87	NA	NA
B-33	263.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-34D	263.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-35D	255.90	NA	NA	NA	246.04	NA	NA	NA	245.69	NA	NA	NA	246.03	NA	NA
B-36D	248.80	NA	NA	NA	230.75	NA	NA	NA	230.29	NA	NA	NA	230.32	NA	NA
B-37	254.10	NA	245.75	247.53	245.53	245.32	244.5	246.00	245.2	DRY	245.59	245.83	NA	NA	NA
B-38D	254.10	NA	239.4	242.46	240.43	237.25	NA	243.34	239.7	236.64	235.05	240.76	239.92	NA	NA
B-39	264.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-40S	192.60	190.25	190.29	190.56	189.9	190.34	NA	190.73	189.77	189.99	190.13	NA	NA	NA	NA
B-41	236.30	219.6	219.82	220.85	220.61	219.07	219.87	225.08	220.2	218.78	218.19	NA	NA	NA	NA
B-42D	236.40	213.85	216.16	216.81	216.53	215.43	218.96	218.21	216.51	215.37	214.87	216.45	216.19	215.57	216.59
B-44D	206.30	199.4	199.28	198.62	198.95	199	199.36	196.12	204.2	197.54	199.2	199.47	198.87	199.27	199.39
B-45	252.50	NA	239.08	243.68	240.94	239	NA	244.87	239.56	NA	DRY	241.17	NA	NA	NA
B-46D	252.50	NA	236.8	240.95	238.55	234.37	237.93	242.06	237.22	233.37	231.57	238.17	NA	NA	NA
B-47D	252.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-48	263.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-49D	263.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-X	201.70	NA	NA	NA	NA	195.91	195.96	198.15	196	195.6	196.04	195.97	197.57	196.13	195.95
B-Y	194.40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-1	233.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2	230.10	NA	211.5	211.52	211.02	210.56	210.90	212.22	210.60	218.06	218.56	218.42	218.11	218.32	218.59
MW-3	232.40	230.05	NA	NA	229.7	NA	NA	NA	229.37	NA	NA	NA	229.54	NA	NA
MW-4	225.70	NA	NA	NA	206.19	NA	NA	NA	206.30	NA	NA	NA	NA	NA	NA
MW-5	224.20	NA	NA	NA	212.05	NA	NA	NA	214.07	NA	NA	NA	NA	NA	NA
MW-6	219.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-7	207.60	NA	NA	NA	196.6	NA	NA	NA	196.40	NA	NA	NA	196.25	NA	NA
MW-8	205.80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-9	195.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-10	194.40	190.45	190.3	190.87	189.67	189.70	NA	192.49	189.67	181.55	190.40	190.37	189.84	190.52	190.90
MW-11D	194.10	189.95	190.36	191.55	190.4	190.83	NA	193.77	190.39	190.26	190.96	NA	191.51	191.70	192.45
MW-12D	192.50	190.05	190.09	190.29	189.54	189.75	NA	190.55	189.45	189.57	190.23	NA	NA	NA	NA
MW-13D	230.30	NA	218.89	218.86	218.30	218.34	218.58	219.82	218.15	210.43	210.78	211.36	210.99	191.71	211.55
MW-14D	247.30	230.03	234.63	237.60	NA	232.29	235.84	241.98	234.80	231.57	230.38	236.55	235.31	232.28	237.35
MW-14S	247.80	233.80	234.47	238.24	NA	232.07	236.12	242.60	234.80	231.01	230.31	NA	NA	NA	NA

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Table 1
Groundwater Elevations
Cresent Road Site, Needham, MA

SURVEY POINT	RIM ELEV. (ft.)	Oct-99 ELEV. (ft.)	Jan-00 ELEV. (ft.)	Apr-00 ELEV. (ft.)	Jul-00 ELEV. (ft.)	Oct-00 ELEV. (ft.)	Jan-01 ELEV. (ft.)	Apr-01 ELEV. (ft.)	Jul-01 ELEV. (ft.)	Oct-01 ELEV. (ft.)	Jan-02 ELEV. (ft.)	Jan-02 ELEV. (ft.)	Jul-02 ELEV. (ft.)	Oct-02 ELEV. (ft.)	Jan-03 ELEV. (ft.)
MW-15S	236.98	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-16D	236.94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-17D	200.25	187.83	NA	NA	188.78	NA	NA	NA	188.93	NA	NA	NA	175.49	NA	NA
MW-18S	200.22	189.07	NA	NA	188.88	NA	NA	NA	188.92	NA	NA	NA	189.91	NA	NA
MW-19D	198.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-20D	193.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-21S	193.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-22D	199.51	189.06	189.01	189.2	188.61	188.85	188.81	189.79	188.77	188.91	NA	189.36	189.24	189.41	189.39
MW-23M	199.74	189.04	189.05	189.21	188.24	188.86	188.94	189.58	189	189.33	NA	160.24	189.62	190.54	190.24
MW-24S	199.66	189.06	189.05	189.2	188.36	188.88	188.91	189.70	189.06	189.24	NA	189.64	NA	NA	NA
MW-25D	188.71	NA	188.15	AC	188.06	188.37	188.21	188.71	187.91	188.21	NA	188.52	188.54	188.61	188.59
MW-26S	188.60	NA	188.31	AC	188.25	188.11	188.10	188.60	188.00	188.10	NA	188.49	188.43	188.60	188.60
MW-27D	196.84	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-28S	196.72	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-29D	200.05	NA	NA	NA	188.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-30D	201.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-31M	201.96	NA	NA	NA	186.24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-32S	202.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-101-DO	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-101-SO	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW01-4	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-1	257.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-2	257.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-3	256.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-4	258.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-5	257.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-6	254.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-7	257.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-8	254.70	NA	246.89	247.88	246.91	245.52	247.11	248.77	246.38	243.05	242.16	247.07	246.65	244.70	244.70
STM-9	256.70	NA	246.41	248.4	247.15	245.5	247.15	250.43	246.65	242.05	240.01	247.51	246.52	NA	NA
STM-10	263.70	248.45	249.35	250.73	249.5	246.7	249.46	252.71	249.09	244.92	243.89	249.87	249.08	NA	NA
STM-11	263.40	NA	250.43	251.41	250.28	248.25	250.14	252.68	249.75	246.74	246.14	250.59	249.90	NA	NA
STM-12	263.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-13	256.10	239.38	241.14	245.00	243.00	236.54	241.70	249.45	241.80	DRY	233.88	242.33	240.93	NA	NA
CW-36D	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CW-37S	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BR-N	257.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BR-S	253.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RW-N	253.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RW-C1	253.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RW-C2	254.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SHAW-01	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SHAW-02	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 1
Groundwater Elevations
Cresent Road Site, Needham, MA

SURVEY POINT	Apr-03 ELEV. (ft.)	Jul-03 ELEV. (ft.)	Nov-03 ELEV. (ft.)	Jan-04 ELEV. (ft.)	Apr-04 ELEV. (ft.)	Jul-04 ELEV. (ft.)	Oct-04 ELEV. (ft.)	Feb-05 ELEV. (ft.)	Apr-05 ELEV. (ft.)	Jul-05 ELEV. (ft.)	Jul-06 ELEV. (ft.)	Jul-07 ELEV. (ft.)	Jul-08 ELEV. (ft.)	Jul-09 ELEV. (ft.)	Jul-10 ELEV. (ft.)	Jul-12 ELEV. (ft.)
MDL-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL-11	NA	NA	NA	NA	NA	235.92	NA	NA	NA	238.63	NA	NA	NA	NA	NA	NA
GB-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GB-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GB-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GT-1D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GT-2I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GT-3D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GT-4I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-16	NA	228.30	NA	NA	NA	227.32	NA	NA	NA	227.8	NA	NA	NA	NA	NA	NA
B-17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-18	NA	220.84	NA	NA	NA	220.29	NA	NA	NA	220.35	NA	NA	NA	NA	NA	NA
B-19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	219.80
B-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-23	206.45	204.76	203.37	204.91	206.18	204.65	205.38	205.65	205.14	204.8	204.85	204.75	205.41	204.8	204.8	204.95
B-24	NA	obst@2.6'	NA	NA	NA	189.68	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-26D	NA	NA	NA	232.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	231.55	NA	NA
B-27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-28D	221.23	219.33	218.46	219.51	220.92	218.27	219.56	220.12	220.75	207.93	219.83	219.51	219.52	226.16	219.11	225.88
B-29D	NA	NA	NA	NA	NA	191.85	NA	NA	NA	191.85	NA	NA	NA	NA	NA	NA
B-30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes: NA- Not A
Wells without sh

Table 1
Groundwater Elevations
Cresent Road Site, Needham, MA

SURVEY POINT	Apr-03 ELEV. (ft.)	Jul-03 ELEV. (ft.)	Nov-03 ELEV. (ft.)	Jan-04 ELEV. (ft.)	Apr-04 ELEV. (ft.)	Jul-04 ELEV. (ft.)	Oct-04 ELEV. (ft.)	Feb-05 ELEV. (ft.)	Apr-05 ELEV. (ft.)	Jul-05 ELEV. (ft.)	Jul-06 ELEV. (ft.)	Jul-07 ELEV. (ft.)	Jul-08 ELEV. (ft.)	Jul-09 ELEV. (ft.)	Jul-10 ELEV. (ft.)	Jul-12 ELEV. (ft.)
B-31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-32D	NA	240.13	NA	NA	NA	239.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-33	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-34D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-35D	NA	246.10	NA	NA	NA	245.45	NA	NA	NA	245.65	NA	NA	NA	NA	NA	NA
B-36D	NA	231.41	NA	NA	NA	229.69	NA	NA	NA	230.8	230.61	230.24	230.49	230.60		228.85
B-37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-38D	NA	241.35	NA	NA	NA	238.70	NA	242.62	243	241.35	239.68	239.95	239.88	241.37	237.12	241.70
B-39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-40S	NA	190.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-42D	218.11	216.65	217.37	216.68	217.70	216.18	217.13	219.21	218.62	217.01	216.64	217	216.83	217.40	216.79	217.17
B-44D	198.53	199.20	204.51	199.37	200.88	198.77	199.59	200.59	199.81	199.18	199.4	198.83	199.98	NA	199.15	199.59
B-45	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-46D	242.50	NA	236.20	239.25	240.95	NA	NA	NA	NA	238.55	238.85	238	237.26	237.70		233.27
B-47D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-49D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-X	197.58	195.96	196.25	195.74	197.06	195.53	195.93	NA	196.23	NA	NA	NA	NA	195.88	195.77	CLOGGED
B-Y	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2	213.73	218.22	218.68	218.50	219.23	218.40	218.52	219.72	218.51	NA	218.43	227.25	218.33	218.65	NA	218.15
MW-3	NA	229.99	NA	NA	NA	229.28	NA	NA	NA	229.91	229.86	220.55	230.10	230.52	NA	229.62
MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-7	NA	196.80	NA	NA	NA	196.04	NA	NA	NA	196.5	196.55	NA	NA	NA	NA	NA
MW-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-10	192.19	190.27	187.65	192.75	193.25	189.67	190.39	191.97	191.11	189.92	189.62	189.64	191.00	191.13	189.71	190.01
MW-11D	193.40	191.83	192.39	187.18	188.56	190.39	190.53	192.09	192.58	191.48	190.57	191.1	191.39	NA	191.8	191.55
MW-12D	NA	189.87	189.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-13D	212.73	211.06	211.51	211.36	212.35	210.76	211.65	212.47	211.75	211.25	210.9	211.1	211.90	211.86	NA	211.00
MW-14D	239.78	237.17	234.10	236.23	238.73	233.98	236.72	237.72	238.55	235.77	234.39	235	234.63	236.84	NA	235.40
MW-14S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes: NA- Not A
Wells without sh

Table 1
Groundwater Elevations
Cresent Road Site, Needham, MA

SURVEY POINT	Apr-03 ELEV. (ft.)	Jul-03 ELEV. (ft.)	Nov-03 ELEV. (ft.)	Jan-04 ELEV. (ft.)	Apr-04 ELEV. (ft.)	Jul-04 ELEV. (ft.)	Oct-04 ELEV. (ft.)	Feb-05 ELEV. (ft.)	Apr-05 ELEV. (ft.)	Jul-05 ELEV. (ft.)	Jul-06 ELEV. (ft.)	Jul-07 ELEV. (ft.)	Jul-08 ELEV. (ft.)	Jul-09 ELEV. (ft.)	Jul-10 ELEV. (ft.)	Jul-12 ELEV. (ft.)
MW-15S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-16D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-17D	NA	189.65	NA	NA	NA	189.46	189.46	NA	NA	175.49	NA	NA	NA	NA	NA	NA
MW-18S	NA	189.91	NA	NA	NA	189.76	NA	NA	NA	189.98	NA	NA	NA	NA	NA	NA
MW-19D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-20D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-21S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-22D	190.23	189.22	189.51	189.30	189.96	189.09	189.32	189.19	189.41	189.06	189.02	188.81	189.60	189.69	189.59	189.35
MW-23M	190.67	189.61	189.91	189.71	190.38	189.47	188.62	189.83	189.92	189.46	189.41	189.34	189.99	190.06	189.96	189.42
MW-24S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-25D	188.71	188.46	NA	188.31	188.71	188.10	188.51	188.61	188.61	188.21	188.71	187.91	NA	188.51	188.71	NA
MW-26S	188.60	188.45	NA	188.30	188.60	188.23	188.40	188.6	188.5	188.5	188.6	187.8	NA	188.60	188.60	188.20
MW-27D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-28S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-29D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-30D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-31M	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-32S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-101-DO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26.72	10.98
MW-101-SO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.84	8.46
MW01-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22.24	19.08
STM-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-8	248.81	247.79	246.85	245.77	248.26	245.79	247.37	NA	248.19	247.62	247.7	247.31	246.92	248.06	246.3	247.24
STM-9	NA	248.65	NA	NA	NA	245.30	NA	NA	NA	247.7	248.19	247.72	246.07	248.92	246.1	247.85
STM-10	NA	250.20	NA	NA	NA	247.88	NA	NA	NA	244.95	246.8	249.8	250.79	252.13	249.69	250.39
STM-11	NA	250.72	NA	NA	NA	248.62	NA	NA	NA	NA	NA	250.19	250.16	251.48	249.14	250.47
STM-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
STM-13	NA	244.25	NA	NA	NA	239.26	NA	NA	NA	242.29	242.85	242.3	240.04	243.90	NA	241.59
CW-36D	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.87	NA
CW-37S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BR-N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BR-S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RW-N	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RW-C1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RW-C2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SHAW-01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26.56	11.19
SHAW-02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.26	8.24

Notes: NA- Not /
Wells without sh

Table 3
Summary of Key Hillslide School Well TCE Data

Well ID	TCE (ug/L)	Date
MW-10	6,125	6/21/00
	7,000	7/1/01
	6,650	7/1/02
	7,700	7/1/03
	8,000	7/13/04
	9,800	7/21/05
	8,100	8/17/06
	7,800	7/2/07
	8,500	7/30/08
	9,300	8/3/09
	9,300	6/28/10
	7,700	8/17/11
	9,600	7/9/12

Well ID	TCE (ug/L)	Date
MW-11D	1,163	6/21/00
	650	7/1/01
	930	7/1/02
	900	7/1/03
	1000	7/13/04
	1,100	7/21/05
	820	8/17/06
	750	7/2/07
	1,900	7/30/08
	1,400	8/13/09
	350	6/28/10
	1,400	8/17/11
	1,600	7/9/12

B-23	293	6/21/00
	1,800	7/1/01
	36	7/1/02
	69	7/1/03
	160	7/13/04
	100	7/21/05
	150	7/17/06
	110	7/2/07
	98	7/30/08
	90	8/24/09
	72	7/2/10
	55	8/17/11
	74	7/9/12

B-44D	2,325	6/21/00
	110	7/1/01
	1,020	7/1/02
	990	7/1/03
	340	7/13/04
	920	7/21/05
	1,100	7/17/06
	740	7/2/07
	750	7/30/08
	590	8/24/09
	600	7/2/10
	490	8/17/11
	380	7/9/12

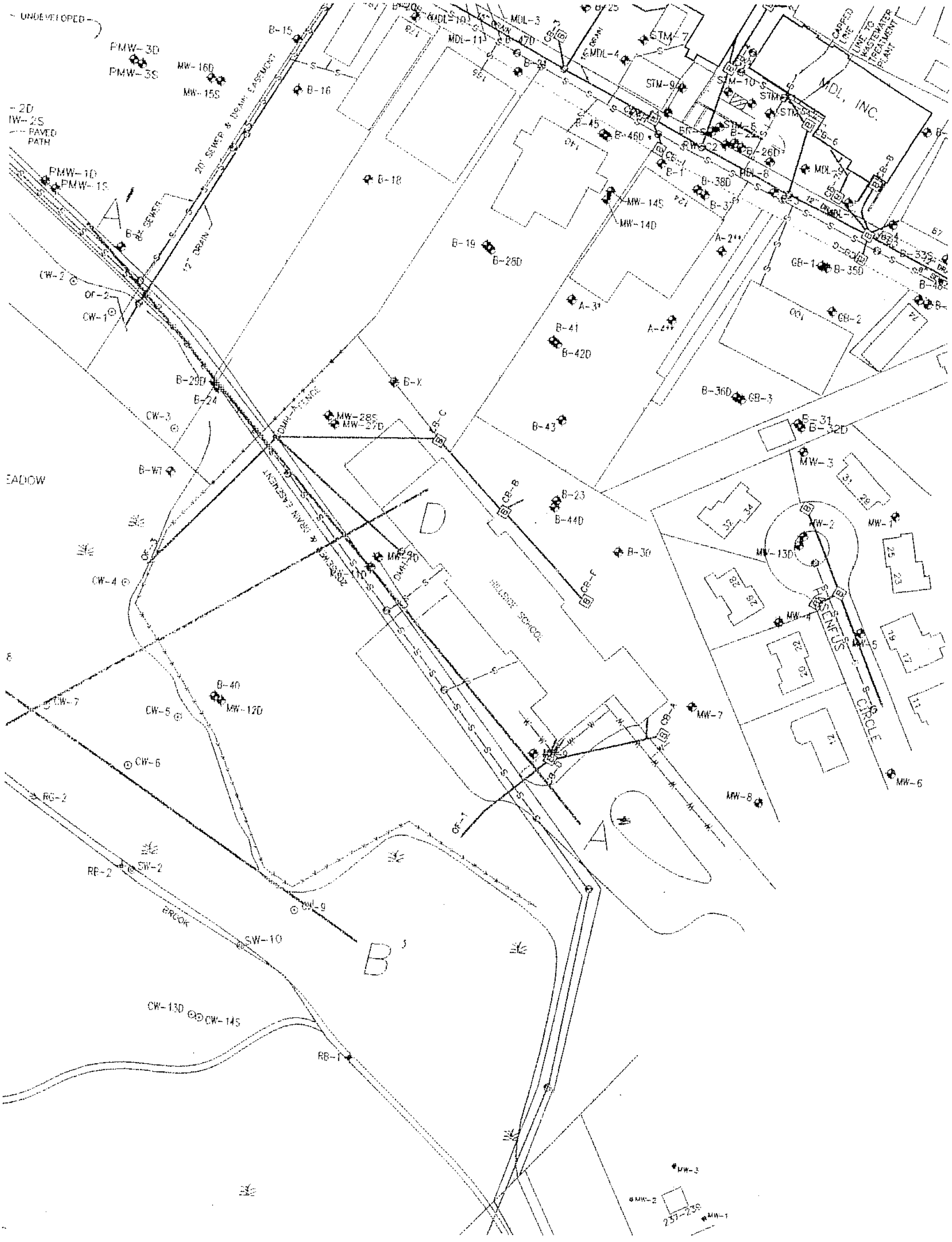
B-X	7,000	6/21/00
	2,400	7/1/01
	4,070	7/1/02
	190	7/1/03
	1,300	10/26/04
	2300	4/5/05
	920	8/17/06
	3100	7/2/07
	1500	7/30/08
	3500	8/18/09
	1700	7/2/10
	2,400	8/17/11
	2,500	7/9/12

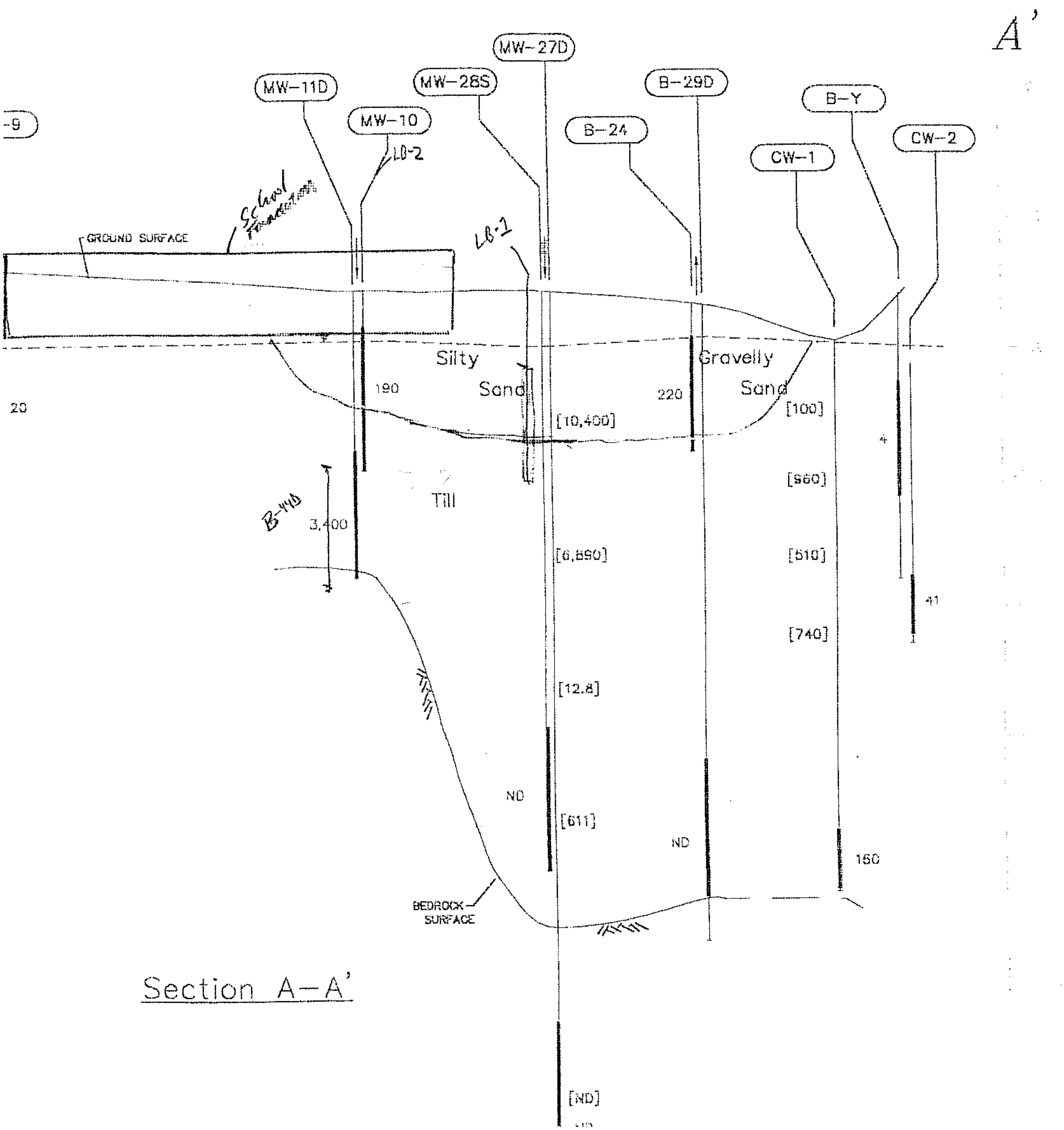
LB-1/MW	890	8/19/2010
	180	8/17/2011
	310	8/16/2012

LB-2/MW	91	8/19/2010
	40	8/17/2011
	74	8/16/2012

Note: MCP Method 1 Groundwater Cleanup Standard GW-2 is 30 ug/L, GW-3 is 5,000 ug/L.

APPENDIX A


UNDEVELOPED
PMW-3D
PMW-3S
MW-16D
MW-15S
B-15
B-16
B-18
B-19
B-28D
PAVED PATH
PMW-1D
PMW-1S
20' SEWER & DRAIN EASEMENT
12" DRAIN
SEWER
CW-2
OF-2
CW-1
B-29D
B-24
CW-3
B-W7
EADOW
CW-4
OF-3
DRAIN EASEMENT
CHAIN-LINK FENCE
MW-28S
MW-27D
B-X
B-C
CB-B
CB-F
MW-10
MW-11D
D
SCHOOL
B-40
MW-12D
CW-5
CW-6
CW-7
RG-2
RB-2
SW-2
BROOK
CW-9
SW-10
B
CW-13D
CW-14S
RB-1
OF-1
A
CB-A
MW-7
MW-8
B-25
MDL-3
MDL-10
MDL-11
B-47D
STM-7
MDL-4
STM-9
STM-10
STM-5
B-45
B-46D
CB-1
B-1
B-38D
B-37
RW-2
B-26D
MDL-8
MDL-7
MW-14S
MW-14D
A-2
A-3
A-4
B-41
B-42D
B-43
B-23
B-44D
B-30
B-36D
GB-3
GB-1
B-35D
GB-2
B-31
B-32D
B-33S
B-48
MW-3
MW-1
MW-2
MW-13D
MW-4
MW-5
MW-6
SENFUS CIRCLE
MDL, INC.
CAPPED LINE
LINE TO WASTEWATER TREATMENT PLANT
MW-3
MW-2
MW-1
237-239


A'
MW-27D
MW-11D
MW-28S
B-29D
B-Y
-9
MW-10
B-24
CW-2
CW-1
LB-2
School Foundation
LB-1
GROUND SURFACE
Silty
Sand
Gravelly
Sand
190
220
20
[100]
[10,400]
4
[960]
Till
B-44D
3,400
[6,890]
[510]
41
[740]
[12.8]
ND
[611]
ND
160
BEDROCK SURFACE
[ND]

Section A–A'

Lord Associates, Inc.
Environmental Consulting & LSP Services
1506 Providence Highway
Suite 30
Norwood, MA 02062
Voice: 781.255.5554
Fax: 781.255.5535

SOIL TEST BORING LOG & WELL COMPLETION REPORT

BORING: **LB-2**
WELL: **LB-2/MW**

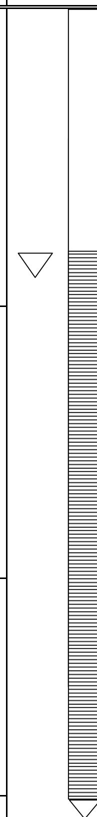
CONTRACTOR:	Technical Drilling Services	**SITE LOCATION:**	Hillside Elementary School	**WELL RISER:**	4' (2.0-inch PVC)
DRILLER:	Matt	**PROJECT NO.:**	1564	**WELL SCREEN:**	10' (2.0-inch 0.10-slot PVC)
SUPERVISOR:	Ralph Tella	**START DATE:**	08/03/10	**OBSERVED DTW:**	4.5 feet
EQUIPMENT:	Geoprobe 6610DT	**FINISH DATE:**	08/03/10		

DIRECT-PUSH BORING & WELL COMPLETION LOG

DEPTH (FT)	SAMPLE ID	% RECOVERY	SAMPLE INTERVAL	PID READING ppm-v	SOIL DESCRIPTION
0.0					grass/loam. 0-0.5'
0.0–5.0	S-1	100%	0.5-5'	<0.2	Coarse Sand and Gravel. Very dense, brown, dry
5.0–10.0	S-2	100%	5-10'	<0.2	Silty Sand, Very dense, gray/brown, wet
10.0–14.0	S-2	100%	5-10'	<0.2	Silty Sand, Very dense, gray/brown, wet
14.0					BOTTOM OF BORING AT 14'

Depth scale (FT): 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, 21.0, 22.0, 23.0, 24.0, 25.0, 26.0

WELL COMPLETION



TERMS

Proportion	Definition
trace	0% - 10%
little	10% - 20%
some	20% - 35%
and	35% - 50%

NOTES
WELL RISER IS COMPLETED AT APPROXIMATELY SURFACE GRADE
SAND FILL AROUND ENTIRE SCREEN LENGTH
2 FEET OF MEDIUM BENTONITE ABOVE FILTER SAND
PORTLAND CEMENT USED TO SEAL ROADBOX AT SURFACE

Lord Associates, Inc.
Environmental Consulting & LSP Services

1506 Providence Highway
Suite 30
Norwood, MA 02062
Voice: 781.255.5554
Fax: 781.255.5535

SOIL TEST BORING LOG & WELL COMPLETION REPORT

BORING: **LB-1**
WELL: **LB-1/MW**

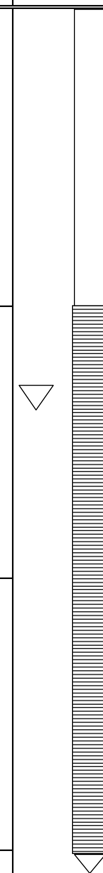
CONTRACTOR:	Technical Drilling Services	**SITE LOCATION:**	Hillside Elementary School	**WELL RISER:**	5' (2.0-inch PVC)
DRILLER:	Matt	**PROJECT NO.:**	1564	**WELL SCREEN:**	10' (2.0-inch 0.10-slot PVC)
SUPERVISOR:	Ralph Tella	**START DATE:**	08/03/10	**OBSERVED DTW:**	7 feet
EQUIPMENT:	Geoprobe 6610DT	**FINISH DATE:**	08/03/10		

DIRECT-PUSH BORING & WELL COMPLETION LOG

DEPTH (FT)	SAMPLE ID	% RECOVERY	SAMPLE INTERVAL	PID READING ppm-v	SOIL DESCRIPTION
0.0–5.0	S-1	100%	0.5-5'	<0.2	grass/loam. 0-0.5' Coarse Sand and Gravel. Very dense, brown, dry
5.0–10.0	S-2	100%	5-10'	<0.2	Coarse Sand and Gravel. Very dense, brown, wet
10.0–15.0	S-3	100%	10-15'	<0.2	Coarse Sand and Gravel to 13'. Silty Sand, dense, gray, wet to 15'
15.0					BOTTOM OF BORING AT 15'

Depth scale (FT): 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, 21.0, 22.0, 23.0, 24.0, 25.0, 26.0

WELL COMPLETION



TERMS

Proportion Definition

trace	0% - 10%
little	10% - 20%
some	20% - 35%
and	35% - 50%

NOTES

WELL RISER IS COMPLETED AT APPROXIMATELY SURFACE GRADE
SAND FILL AROUND ENTIRE SCREEN LENGTH
2 FEET OF MEDIUM BENTONITE ABOVE FILTER SAND
PORTLAND CEMENT USED TO SEAL ROADBOX AT SURFACE

Well B-X

URS Company, Inc.
CONSULTING ENGINEERS
NEW YORK NEW JERSEY

TEST BORING LOG

BORING NO. OW-13

SHEET NO. 1 OF 1

PROJECT:	Microwave Development Labs site-MASS FIT
CLIENT:	Massachusetts DEQE
BORING CONTRACTOR:	Guild Drilling Company
JOB NO.:	35092.11
ELEVATION:	
DATE STARTED:	11/7/86
DATE FINISHED:	11/11/86
DRILLER:	Mike Costigan
DRILL RIG:	
INSPECTOR:	AJL

GROUND WATER DATE	TIME	WATER EL.	SCREEN		CAS.	SAMP.	CORE	TUBE
				TYPE		SS		
			4.50-14-20'	DIA.	4"	2"		
				WT.	-	140lb		
				FALL	-	30"		

WELL CONSTRUCTION	DEPTH FEET	SAMPLE NO.	TYPE	BLOWS PER 6 INCHES	DESCRIPTION	REMARKS
Conc / Fill / Bent	0	S1	SS	4 4 / 11 12	Dark brown organic clayey SILT, some gravel. Soft, loose, moist. TOPSOIL — 0.5'	TIP = 4.8 Max Fluctuating
SAND		S2	SS	12 15 / 18 12	Brown fine sandy SILT/Silty fine SAND. Moist, loose, some gravel. TILL — 4.5'	TIP = 380 Max. Fluctuating 125-Semi-stable
	5	S3	SS	9 19 / 30 47	Brown medium to coarse sand, some gravel. Saturated, loose. TILL.	TIP = 400 Max. Fluctuating 95 Semi-stable
	10	S4	SS	16 21 / 22 27	SILT & fine SAND Matrix	TIP = 250 Max. Fluctuating 110 Semi-stable
	15				Refusal at 14.0 ft Drilled to 14.2 ft into bedrock or boulder	
	20					∇ 5.20'
	25				SS = SPLIT-SPOON SAMPLER	
	30					
	35					
	40					
	45					

Well Construction-11/11/86

- 2 Bags Sand
- 2 Gallons Bentonite Pellets
- 1 Bag Cement
- 10 ft PVC Screen
- 4 ft PVC Riser
- 1 Curb Box

A-2059

KURZ ASSOCIATES, INC.
TEST BORING LOG

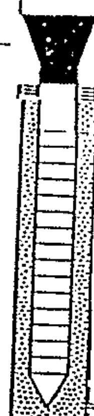
Boring No.: 23
Sheet No. 1 of: 1

Project: Microwave Dev. Labs No. 391
Location: Crescent Road, Needham, MA
Date Started: 11/22/88 Finished: 11/22/88
Surface Elev: ______ Datum: ______

	CASING	SAMPLER	BIT
Type:	H.S.A.	S.S.	
SizeID:	3-3/4"	1-3/8"	
Hammer Wt.:		140 lb	
Hammer Fall:		30"	

GROUNDWATER OBSERVATIONS

Depth	Date	Casing/Screen	Stabil. Time
3'			

DEPTH	CASING BLOWS	SAMPLE DATA ID	PEN/ REC	BLOWS PER 6"	DRILLING ACTIVITY (procedural comments)	WELL DATA	STRATA CHANGE	LITHOLOGY (sample description)	FIELD TEST DATA TYPE PID	REMARKS
		S-1	0-2'	Grab				Surface: Grass	0.2 ppm	
								Gravelly Silty Sand: organic rich fine to		
5		S-2	18/18	16-10-37			4'	coarse sand, 20-30% fines, gravel, pebbles, roots, wet, dark brown	4.5 ppm	
								Glacial Till: Sandy Silt; light brown fines		
10		S-3	18/15	28-40-42				30-40% fine to coarse sand, pebbles, light		
							11.5'	brown. Increase in sand with depth.	3.5 ppm	
								Bottom of boring @ 11.5'		
15										
20										
25										
30										

REMARKS: Acker AD-2 Drill Rig

KURZ ASSOCIATES, INC.
TEST BORING LOG

Boring No.: 30 of: ___
Sheet No. 1 of: 1

Project: Microwave Dev. Labs No. 391
Location: Crescent Road, Needham, MA

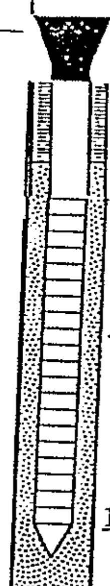
Date Started: 6-23-89 Finished: 6-23-89
Surface Elev: ______ Datum: ______

	CASING	SAMPLER	BIT
Type:	HW-NW	SS	
SizeID:	4" 3"	1-3/8"	
Hammer Wt.:	300 lb	300 lb	
Hammer Fall:	24"	30"	

GROUNDWATER OBSERVATIONS

Depth	Date	Casing/Screen	Stabil. Time

DEPTH	CASING BLOWS	SAMPLE DATA ID	PEN/REC	BLOWS PER 6"	DRILLING ACTIVITY (procedural comments)	WELL DATA	STRATA CHANGE	LITHOLOGY (sample description)	FIELD TEST DATA TYPE PID	REMARKS
		1						Surface: Grass Silty Sand: fine to coarse sand, 25-35% silt and clay, some gravel and pebbles brown color	0.4 ppm	
5		2							0.4 ppm	
							7	Gravelly Sand: fine to coarse sand, 25-35% fine to medium gravel, some fines and pebbles		
10		3					9	Glacial Till: Silty Sand; fine to coarse sand, 30-40% fines, some pebbles and gravel	1.0 ppm	
15							15'	Bottom of boring @ 15'		
20										
25										
30										



REMARKS: * Used 300 lb hammer. Drilling method used roller bit, then spin HW casing

Contractor:

KURZ ASSOCIATES, INC.
TEST BORING LOG

Boring No.: B-44D
Sheet No. 1 of: 2

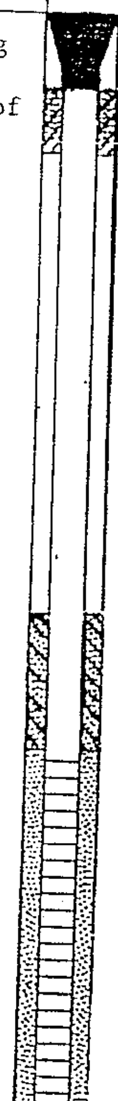
Project: Microwave Dev. Labs No. 391
Location: Crescent Road Needham, MA
Date Started: 8/28/90 Finished: 8/29/90
Surface Elev: N.D. Datum: N/A

	CASING	SAMPLER	BIT
Type:	NW/HW/PW	SS	
SizeID:	3/4/5"	1-3/8"	
Hammer Wt.:	300	300	
Hammer Fall:	30"	30"	

GROUNDWATER OBSERVATIONS

Depth	Date	Casing/Screen	Stabil. Time
7.16	9/5/90	from lip of road box	8 Days

DEPTH	CASING BLOWS	ID	PEN/REC inches	BLOWS PER 6"	DRILLING ACTIVITY (procedural comments)	WELL DATA	STRATA CHANGE	LITHOLOGY (sample description)	FIELD TEST DATA TYPE HNU (ppm)	REMARKS
					Wash Boring from grade to bottom of boring. PW to 15' HW to 32' NW to 35'			Surface; Grass		
		S-1	24/20	7/6/6/6				Glacial Till: Sandy Silt; 30-40% fine to coarse sand,<10% gravel, moist, light brown.	2.4	
10		S-2	24/18	12/5/8/6				Glacial Till: same as above, lenses of subangular light brown sand, increase in gravel %, light brown.	4.6	
		S-3	24/18	7/7/9/8				Glacial Till: Sandy Silt; 30-40% fine to coarse sand, increase in density, decrease in gravel %.	7.2	
20		S-4	24/.5	8/5/9/8				Glacial Till: fragments similiar to above.	6.0	
		S-5	24/24	16/39/49/45				Glacial Till: same as above, very dense.	6.4	
30		S-6	29/31	12/11/14/15				Glacial Till: Silt; slightly plastic, grey.	22.0	



REMARKS: Drill Rig: CME-55
N.D. - not detected (<0.2 ppm). 2" PVC Installation

Contractor: Guild Drilling Co. Driller: Glenn Peterson Inspector: Brian Klingler

KURZ ASSOCIATES, INC.
TEST BORING LOG

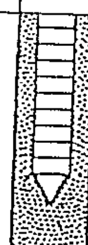
Boring No.: B-44D
Sheet No. 2 of: 2

Project: Microwave Dev. Labs No. 391
Location: Crescent Road Needham, MA
Date Started: 8/28/90 Finished: 8/29/90
Surface Elev: N.D. Datum: N/A

	CASING	SAMPLER	BIT
Type:	NWHWPW	SS	
SizeID:	3/4/5"	1-3/8"	
Hammer Wt.:	300	300	
Hammer Fall:	30"	30"	

GROUNDWATER OBSERVATIONS

Depth	Date	Casing/Screen	Stabil. Time
7.16	9/5/90	from lip of road box	7 Days

DEPTH	CASING BLOWS	SAMPLE DATA ID	PEN/REC inches	BLOWS PER 6"	DRILLING ACTIVITY (procedural comments)	WELL DATA	STRATA CHANGE	LITHOLOGY (sample description)	FIELD TEST DATA TYPE HNU (ppm)	REMARKS
30								Glacial Till: (cont.)		
							33'			
		S-7	2/.5	100-2"				Weathered Shist: weathered top of bedrock	N.D.	
							37'	Bottom of Boring 37'		
40										
50										
60										

REMARKS: Drill Rig: CME-55
N.D. - not detected (<0.2 ppm).

Contractor: Guild Drilling Co. Driller: Glen Peterson Inspector: Brian Klingler

CLEAN HARBORS ENVIRONMENTAL ENGINEERING
325 Wood Road, Braintree, MA 02184
(617) 849-1200

Project Name:	Highland School	CHEE Job #:	E-7017
Project Location:	Needham, MA	Field Book No.	89-283
Client Name:	Mass. Department of Environmental Protection	Well Elevation:	194.13
Boring Location:	See Plan	Driller:	P. Thornsbury
Drilling Contractor:	CHEE	CHEE Personnel:	P. Gowaski
Drilling Method:	Hollow Stemmed Auger	Start Date:	2/20/90
Casing/Auger Size:	4.25" Sampler: Split Spoon	Finish Date:	2/20/90

QC Checked By: B. Crocker
Boring No: MW-10
Page: 1 of 1

DEPTH (ft)	SAMPLE Type & No.	Depth from - to (ft)	pen./rec. (in)	Blows per 6 (in) on split spoon	Headspace Field (*1) Sceening Reading	Strata Change Depth	FIELD CLASSIFICATION (*2) AND DRILLING INFORMATION	Notes	well screen	Strata
	SS-1	0-2	24/10	2-7-13-31	0 ppm		Tan, medium dense, fine to coarse SAND, trace fine Gravel, trace Silt. Dry.			
	SS-2	2-4	24/16	30-30-37-37	0 ppm	SAND	Tan, very dense, fine to coarse SAND, trace fine Gravel, trace Silt. Wet odor.			
						4.0'		3		
	SS-3	4-6	24/18	8-18-54-35	1.5 ppm		Tan, very dense, fine to coarse SAND, trace fine Gravel, trace Silt. Wet.			
5										
	SS-4	6-8	24/22	39-33-20-27	2.5 ppm		Similar to SS-3.			
	SS-5	8-10	24/24	19-22-38-30	0 ppm		Similar to SS-3.			
10										
	SS-6	10-12	24/22	12-18-24-21	0 ppm		Tan, dense, fine (+) to medium SAND some Silt. Wet.			
	SS-7	12-14	24/24	15-18-24-39	4.1 ppm		Tan, dense, fine (+) to medium SAND, some Silt, trace fine Gravel. Wet.			
						14.0'		4		
							Bottom of boring.			
15										

SAMPLE TYPES
- SS - split spoon
- ST - shelby tube
- AF - auger flight
- RC - rock core

PERCENTAGE BY WEIGHT

and	= 35-50%
some	= 20-35%
little	= 10-20%
trace	= 1-10%

GRANULAR SOILS

N-value	Density
< 4	very loose
5 - 10	loose
11 - 30	medium
31 - 50	dense
> 50	very dense

COHESIVE SOILS

N-value	Density
< 2	very soft
2 - 4	soft
4 - 8	medium stiff
8 - 15	stiff
15 - 30	very stiff

NOTES:
*1) Field screen instrument used (ppm = parts per million)
*2) The Burmister System is used for field classification of soils.
3) No odor unless otherwise specified.
4) Groundwater encountered approximately 4 feet below ground surface.
5) Groundwater monitoring well installed 14 feet below ground surface using 11 feet slotted PVC; 3 feet solid PVC.

KURZ ASSOCIATES, INC.
TEST BORING LOG

Boring No.: B-11D (MW-11D)
Sheet No. 1 of: 1

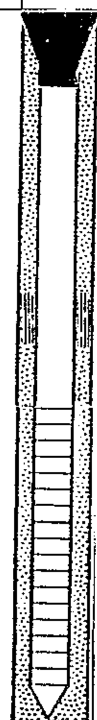
Project: Microwave Dev. Labs No. 391 Date Started: 9/18/91 Finished: 9/18/91
Location: Crescent Road Needham, MA Surface Elev: N.D. Datum: N/A

	CASING	SAMPLER	BIT
Type:	HSA	SS	
SizeID:	4-1/4"	1-3/8"	
Hammer Wt.:	-	140	
Hammer Fall:	-	30"	

GROUNDWATER OBSERVATIONS

Depth	Date	Casing/Screen	Stabil. Time
2.32	11/6/91	from grade from lip of road box	49 Days

DEPTH	CASING BLOWS	SAMPLE DATA ID	PEN/REC inches	BLOWS PER 6"	DRILLING ACTIVITY (procedural comments)	WELL DATA	STRATA CHANGE	LITHOLOGY (sample description)	FIELD TEST DATA TYPE HNU (ppm)	REMARKS
		S-1	---	Grab	Augered from grade to bottom of boring.			Surface: Grass Silty Sand; fine to medium sand, 15-25% non-plastic fines, br.	ND	
		S-2	24/12	9/15/7/21			8'	Silty Sand; same as above.	8.4	
10		S-3	24/12	15/21/27/18				Basal Till: Gravelly Silty Sand; f-c sand, 20-30% fines, 10% gravel, grey/brown.	4.2	
		S-4	24/20	11/21/21/13				Basal Till: same as above.	2.8	
20		S-5	24/12	14/13/20/18			21'	Basal Till: same as above.	ND	
		S-6	1/.5	100-1"				Weathered Bedrock: fragmented Chlorite Schist.	ND	
								Bottom of Boring 22'		
30										



REMARKS: Drilling Rig: Acker ADII
N.D. - not detected (<0.2 ppm).

Contractor: Technical Drilling Serv. Driller: Mark Zork Inspector: Brian Klingler

CYGNUS GROUP INCORPORATED

BORING LOG

Project:	MDL/Needham	Boring No.:	MW-27D
Location:	Hillside School, Needham	Page:	1 of 3
Drilling Contractor:	Technical Drilling Services	Date Started:	12/29/97
Inspected by:	Peter Wilson	Dated Finished:	1/5/98

Well Depth: 65'	Length of Riser: 55'	Length of Screen: 10'	Screen I.D.: 2"	Riser I.D.: 2"

	Casing			Sampler	Bit
Type	HSA	HX	HQ	Split Spoon	Tricone
Size I.D.	4 1/4"	4"	3"	2"	2 7/8"
Hammer WT.	-	-	-	130 lbs	-
Hammer Fall	-	-	-	2'	-

Groundwater Observations		
Depth (ft.)	Date	Stabilization Time
1.8'	1/2/98	Four days

Depth (ft.)	Sample ID	Blows/ 6"	Sample Interval (ft)	Adv./ Rec.	PID (PPMV)	Strata Change	Field Classification Surface: Frozen top soil; 6" thick.
0	S-1	35/26/28/29	0.5-2.5'	2'/1'	1.0		SAND: 35-90% Fine to coarse sand; 10% gravel; brown; dry; dense.
	S-2	41/36/42/45	2.5-4.5	2'/1'	1.8		
	S-3	35/46/48/51	4.5-6.5	2'/1.5'	1.0		Same as above, moist.
5							
	S-4	120-5"	6.5-8.5	5"/2"	1.2		Split spoon blocked by cobble; wet.
	S-5	57/120-5"	8.5-10.5	1'5"/6"	8.2		Same as above; saturated.
10	S-6	22/26/23/25	10.5-12.5	2'/10"	12.4		
	S-7	21/24/26/10	12.5-14.5	2'/1'2"	28.9	12.5'	SAND: 90% fines, 10% medium to coarse sand; brown; dense; saturated.
	S-8	12/14/10/11	14.5-16.5	2'/1'	10.5	14.5	SAND and GRAVEL: 20-25% fine to coarse sand; 25% gravel; less dense; trace cobbles; brown; saturated.
15							
	S-9	12/12/11/110	16.5-18.5	2'/6"	12.3		
	S-10	19-21-26-19	18.5-20.5	2'/2'	35.6	18.5	SAND: 70% fines, 10-20% medium to coarse sand; brown, saturated.
20	S-11	10/12/11/13	20.5-22.5	2'/1'	43.9	20.5	Till: 35% fine to coarse sand: 15% silt; trace gravel, brown/gray; very dense; moist.
	S-12	7/7/9/11	22.5-24.5	2'/1'	28.0		
	S-13	10/12/11/12	24.5-26.5	2'/1'4"	1.9		
25							
	S-14	23/95/120-6"	26.5-28.0	1.5'/1'	2.0		Split spoon blocked by cobble.
	S-15	53/120-3"	28.5-29.25	9"/9"	6.7		

REMARKS: 1) Groundwater encountered at approximately 8 feet below ground surface.

CYGNUS GROUP INCORPORATED

BORING LOG

Project:	MDL/Needham	Boring No.:	MW-27D
Location:	Hillside School, Needham	Page:	2 of 3
Drilling Contractor:	Technical Drilling Services	Date Started:	12/29/97
Inspected by:	Peter Wilson	Dated Finished:	1/5/98

Well Depth: 65′	Length of Riser: 55′	Length of Screen: 10′	Screen I.D.: 2″	Riser I.D.: 2″

	Casing			Sampler	Bit
Type	HSA	HX	HQ	Split Spoon	Tricone
Size I.D.	4 1/4″	4″	3″	2″	2 7/8″
Hammer WT.	-	-	-	130 lbs	-
Hammer Fall	-	-	-	2′	-

Groundwater Observations		
Depth (ft.)	Date	Stabilization Time
1.8′	1/2/98	Four days

Depth (ft.)	Sample ID	Blows/ 6"	Sample Interval (ft)	Adv./ Rec.	PID (PPMV)	Strata Change	Field Classification
30	S-16	27/42/51/45	30.5-32.5	2′/1.5′	2.2		See above.
	S-17	46/52/49/45	32.5-34.5	2′/1′4″	3.1		
	S-18	41/42/120-4″	34.5-36.5	1′4″/1.4″	4.2		
35							
	S-19	52/95/130-6″	36.5-38.5	2′/1.5′	1.2		
	S-20	46/52/95/72	38.5-40.5	2′/1.5′	1.1		
40	S-21	52/71/120-5″	40.5-42.5	1′5″/5″	2.6		
	S-22	48/52/120-3″	42.5-44.5	1′3″/5″	1.7		
	S-23	58/120-3″	44.5-46.5	9″/3″	1.2	44.5	WEATHERED BEDROCK:
45							
	S-24	120-5″	46.5-48.5	5″/3″	1.2		
		Coring Time (min.)					Refusal.
48.5						48.5	BEDROCK: meta-rhyolite, white
49.5		3:00					
50.5		4:00					48.5′-53.5′ RQD = 91.9%
51.5		4:15					Lr = 0.88
52.5		3:30					
53.5		4:00					53.5-58.5′ RQD = 78.2%
54.5		3:45					Lr = 0.92
55.5		4:45					
56.5		4:00					
57.5		3:30					
58.5		4:00					58.5-63.5′ RQD = 94.7%
59.5		4:15					Lr = 0.95

REMARKS: 1) Refusal encountered at approximately 47 feet below ground surface. Roller bit to 48.5 feet. Coring started at 48.5 feet.

CYGNUS GROUP INCORPORATED

BORING LOG

Project:	MDL/Needham	Boring No.:	MW-27D
Location:	Hillside School, Needham	Page:	3 of 3
Drilling Contractor:	Technical Drilling Services	Date Started:	12/29/97
Inspected by:	Peter Wilson	Dated Finished:	1/5/98

Well Depth: 65′	Length of Riser: 55′	Length of Screen: 10′	Screen I.D.: 2″	Riser I.D.: 2″

	Casing			Sampler	Bit
Type	HSA	HX	HQ	Split Spoon	Tricone
Size I.D.	4 1/4″	4″	3″	2″	2 7/8″
Hammer WT.	-	-	-	130 lbs	-
Hammer Fall	-	-	-	2′	-

Groundwater Observations		
Depth (ft.)	Date	Stabilization Time
1.8′	1/2/98	Four days

Depth (ft.)	Sample ID	Coring Time (min.)	Sample Interval	Adv./Rec.	PID (PPMV)	Strata Change	Field Classification
60.5		5:00					See above.
61.5		4:45					
62.5		4:30					
63.5		5:00					63.5-68.5′ RQD = 79.3%
64.5		4:00					Lr = 0.97
65.5		4:15					
66.5		3:30					
67.5		4:30					
68.5		4:00					68.5-73.5′ RQD = 71.1%
69.5		4:30					Lr = 0.74
70.5		4:00					
71.5		3:30					
72.5		5:30					
73.5		5:30					73.5-78.5′ RQD = 92.4%
74.5		4:30					Lr = 0.90
75.5		4:45					
76.5		4:00					
77.5		4:00					
78.5		4:00				78.5	End bedrock coring.

REMARKS:

CYGNUS GROUP INCORPORATED

BORING LOG

Project:	MDL/Needham	Boring No.:	MW-28S
Location:	Hillside School, Needham	Page:	1 of 1
Drilling Contractor:	Technical Drilling Services	Date Started:	12/31/97
Inspected by:	Peter Wilson	Dated Finished:	12/31/97

Well Depth: 44'	Length of Riser: 34'	Length of Screen: 10'	Screen I.D.: 2"	Riser I.D.: 2"

	Casing	Sampler	Bit
Type	HSA	-	-
Size I.D.	4 1/4"	-	-
Hammer WT.	-	-	-
Hammer Fall	-	-	-

Groundwater Observations		
Depth (ft.)	Date	Stabilization Time

Depth (ft.)	Sample ID	Blows/ 6"	Sample Interval	Adv./ Rec.	PID (PPMV)	Strata Change	Field Classification Surface:
0							No split spoon samples collected. Soils observed off auger are consistent with soils encountered at MW-27D (approximately 2 ft. away). See MW-27D boring log for detailed description.
5							
10							
15							
20							
25							
30							

REMARKS: 1) Refusal encountered at approximately 44 feet below ground surface.

Table 12

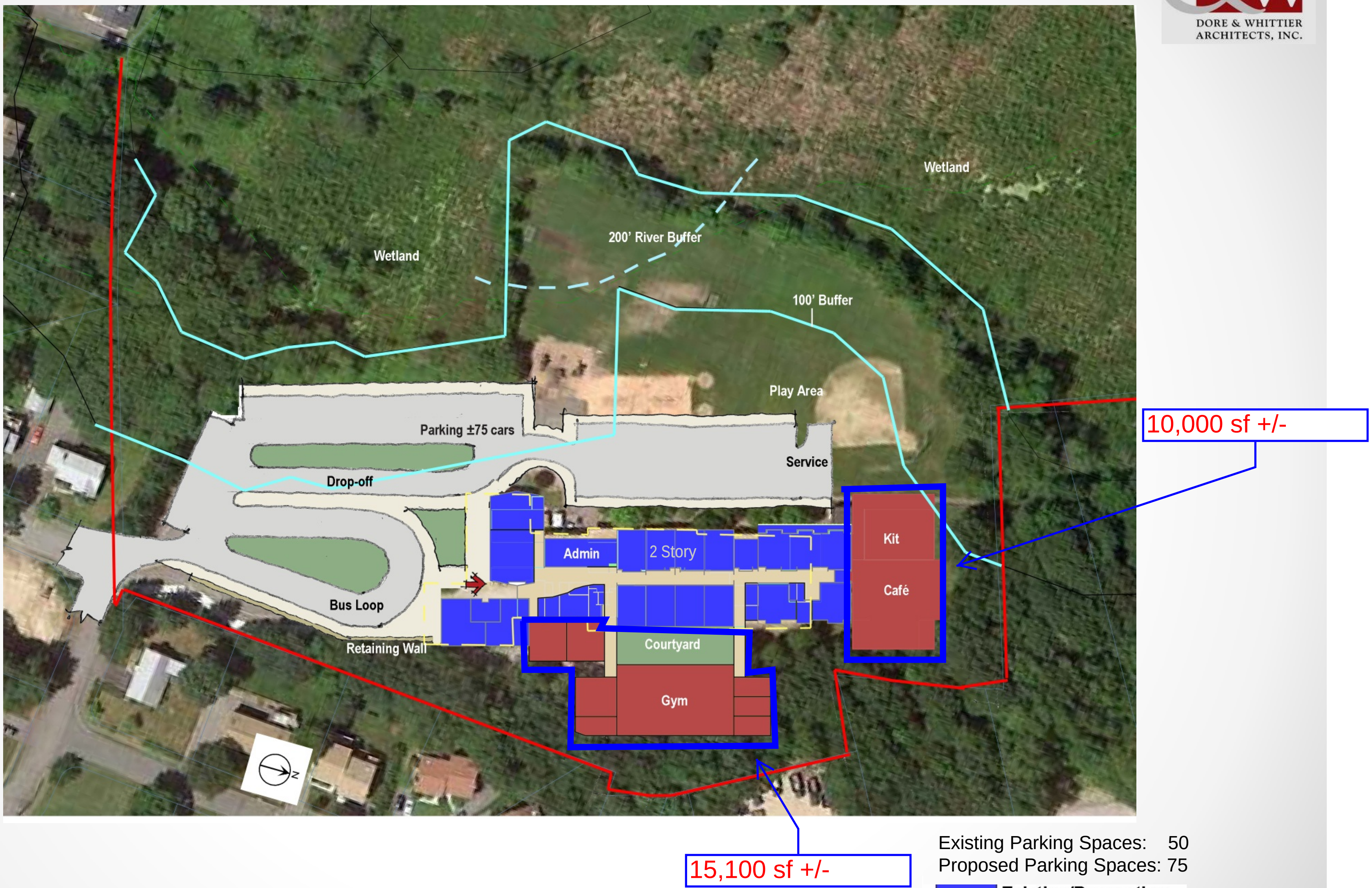
Summary of Natural Attenuation Parameters

Well ID	Date	Alkalinity as CaCO3 (mg/L)	Chloride (mg/L)	Nitrite/Nitrate-N (mg/L)	Specific Conductance (uS/cm)	Total Organic Carbon (mg/L)	Sulfate (mg/L)	Dissolved Oxygen* (mg/L)	pH* (S.U.)	Temperature* oC	ORP* (S.U.)	Ferrous Iron* (mg/L)	Methane (ppm)
B-19	7/9/98	50	59.3	3.07	345	BQL	23.1	5.68	6.54	15.3	196	0.15	93.3
B-23	7/9/98	50	53.7	3.15	449	2	21.2	2.19	8.01	13.2	202	0.1	33.9
B-28	7/9/98	52	156	4.84	720	1	26.2	3.5	7.27	15.5	170	0.1	154
B-40	7/9/98	36	38.9	1.6	261	2	17.1	6.07	7.32	14.4	183	0.3	ND
B-40E (duplicate of B-40)	7/9/98	36	40	1.66	258	2	17.5	NA	NA	NA	NA	NA	NA
B-41	7/9/98	42	98.9	4.18	486	6	21.9	4.1	7.64	15.8	158	2	ND
B-42D	7/9/98	50	87.9	3.96	489	2	23.1	3.74	7.52	16	195	<0.1	25.6
B-44D	7/9/98	132	78.9	1.56	534	1	23.2	3.43	7.23	12.9	168	<0.1	ND
B-X	7/9/98	20	60	2.45	315	2	24.5	6.73	7.23	13.8	200	0.2	23.9
CW-6	7/10/98	26	88.4	1.62	399	1	22.4	7.02	7.53	21.3	204	0.6	ND
CW-52D	7/10/98	78	90.5	2.45	462	3	14.8	1.58	7.71	21.1	-123	>10	ND
CW-76D	7/10/98	54	49.5	BQL	293	7	BQL	NA	NA	NA	NA	NA	112
CW-91D	7/10/98	198	81.1	2.55	379	1	15.3	0.51	6.62	23.7	9	>10	256
CW-93D	7/10/98	314	80	BQL	370	6	BQL	4.38	7.53	20.8	-6	>10	239
MDL-11	7/9/98	9	34.1	6	248	2	31.8	7.12	6.78	16.8	208	0.3	ND
MW-12D	7/9/98	104	49.5	0.5	416	3	14.2	3.6	7.17	11.8	166	0.2	ND
MW-14S	7/9/98	14	43.2	3.14	263	4	25.4	7.94	6.76	20.2	198	0.1	ND
MW-14D	7/9/98	56	143	5.09	720	4	35.3	4.5	8.08	18.2	152	<0.1	14.8
MW-22D	7/9/98	82	30.8	3.4	297	2	20.7	3.1	7.38	12.3	192	0.2	7.1
MW-23M	7/9/98	50	59.3	3.07	345	BQL	23.1	6.54	6.82	12.5	228	3.5	4.9
MW-24S	7/9/98	74	13.2	1.6	204	6	15.2	5.21	6.91	14.7	229	5.5	ND
MW-26S	7/9/98	34	57.1	1.91	309	1	19.2	6.61	9.84	13.9	179	1.5	11.5
MW-25D	7/9/98	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA
STM-8	7/9/98	14	58.2	8.55	380	8	37	3.1	6.8	15.8	126	0.2	ND
STM-10	7/9/98	32	39.6	4.7	298	2	32.8	5.02	6.93	16.3	196	0.4	3.4
STM-11	7/9/98	50	146	10.5	770	4	53.9	5.28	6.82	16.7	193	0.2	24.7

Notes: ORP = oxidation-reduction potential; ppm = parts per million;
* Parameter screend in the field; BQL = below quantitation limit;
NA = not analyzed; ND = Not deteted above 0.5 ppm methane.

APPENDIX B

Option 1A.1



Existing Parking Spaces: 50
Proposed Parking Spaces: 75

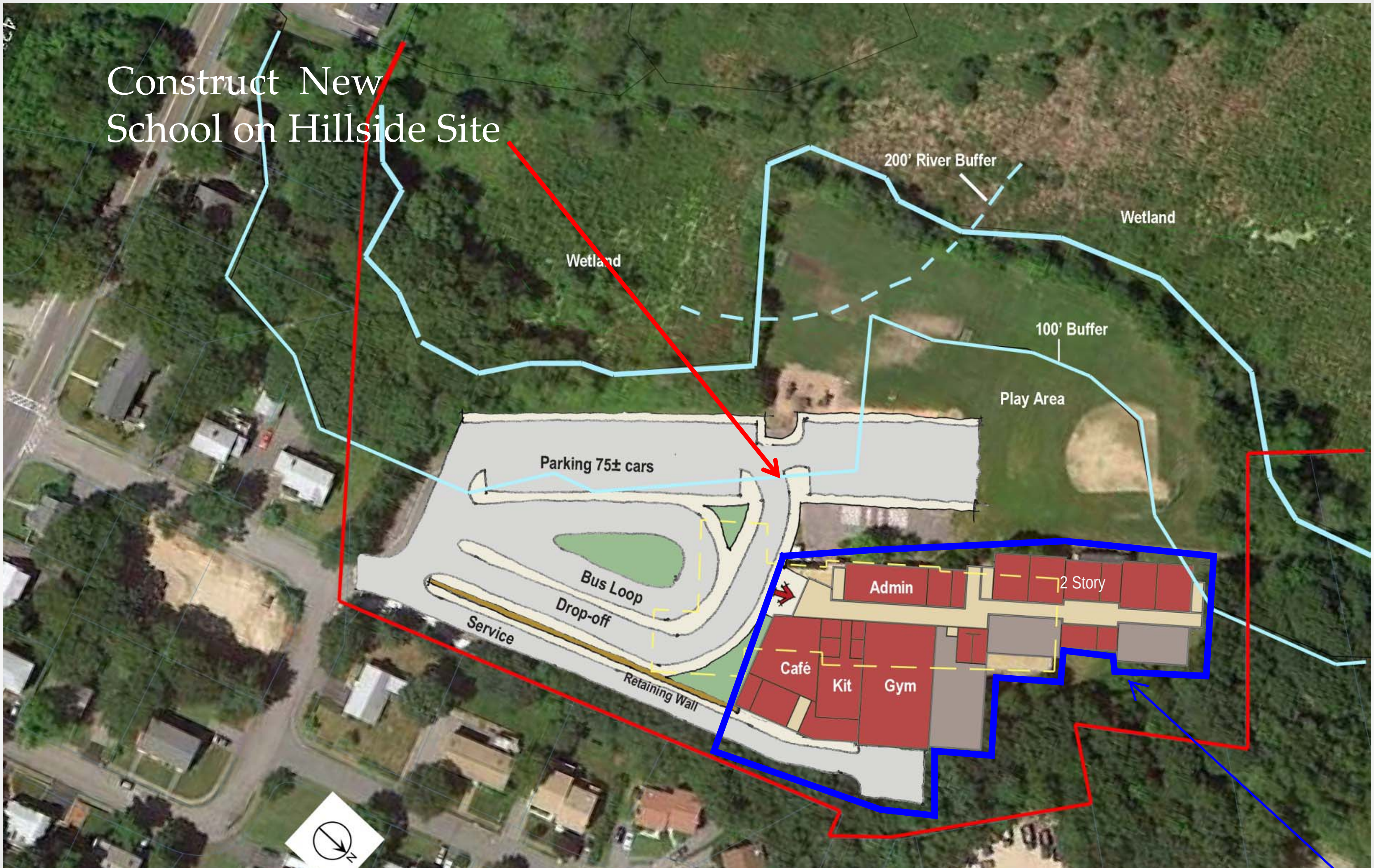
Existing/Renovation

Addition

Hillside Add-Reno for 487 students

Option 1A.2

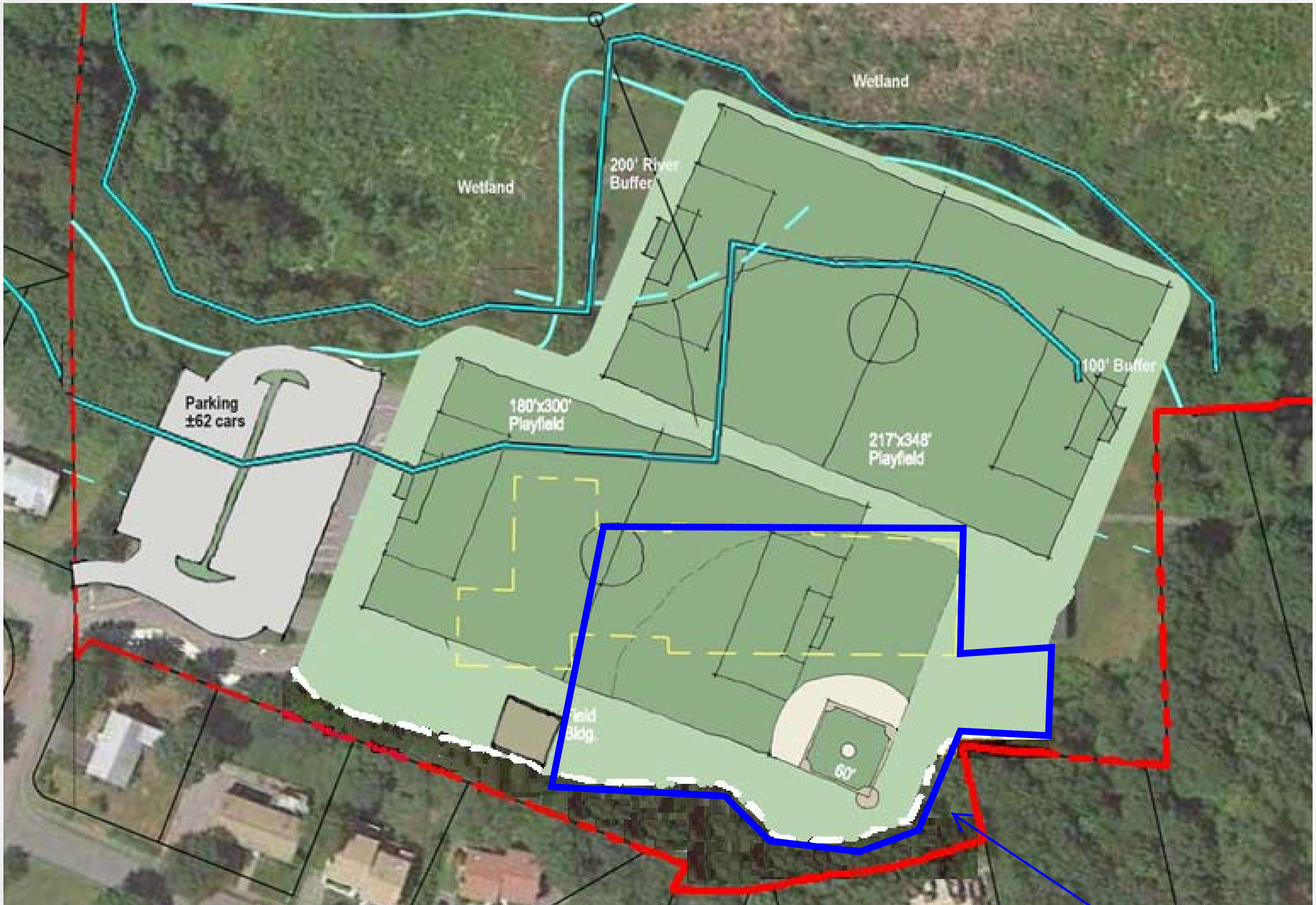
DORE & WHITTIER ARCHITECTS, INC.



Hillside Site- New School for 487 students

38,000 sf Building Footprint
plus 4,000 sf of paved area

Option 1A.3



47,000 sf+/- : area of potential impact from building removal and cut into hillside/ regrading of soil

New Fields at Hillside School Site

Appendix E

MEETING NOTES

MEETING DATE: September 24, 2012

PROJECT: Needham Pre-feasibility Study / Hillside School Environmental Evaluation
Dore and Whittier Architects, Inc. Project #12-633

SUBJECT: PPBC-School Committee

ATTENDING: PPBC Members,
Dept. of Public Facilities: Steve Popper & Hank Haff,
Lord Associates: Ralph Tella
Dore & Whittier Architects: Donald Walter & Michele Rogers
Members of the public

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ARCHITECTS, INC.

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NOTES

The following outline is a summary of notes taken by Dore & Whittier outlining the questions and discussion points of the PPBC meeting to review the draft report developed by Lord Associates in regard to the Hillside School site.

Note: The following questions and issues / questions were raised - clarification to be provided in the final report

1. What is the current status of soil testing in the areas of the "hot spot"?
2. Is additional testing required to further characterize the soils?
3. It is reported that MA landfills will accept soil with contamination of less than 10ppm and it is assumed in the report that the existing soil at the Hillside site meets this criteria however, given the limited soil testing this is an unknown condition. What if are the alternative is it is determined that the soil is greater than 10ppm? Are there on site remediation solutions? If so what is the potential cost of these solution?
4. What are the various construction methods for preventing water and vapor intrusion into a new building? Are there new methods and products that could be used to reduce the possibility of water or vapor intrusion?
5. Would ongoing monitoring and testing be required in a new building on this site? If so what are some of the potential cost?
6. Is the full remediation of the site feasible?

The above is my summation of our meeting. If you have any additions and/or corrections, please contact me for incorporation into these minutes.

DORE & WHITTIER ARCHITECTS, INC.
Architects • Project Managers

Michele Rogers
Project Manager

www.doreandwhittier.com

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