MACTEC

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March 31, 2008

Mr. Joseph T. Martella II, Senior Engineer
RIDEM Office of Waste Management
Site Remediation Program
235 Providence Street
Providence RI, 02908

RE: Active Soil Depressurization System Design
Former Gorham Manufacturing Facility, Parcel A Retail Complex
333 Adelaide Avenue, Providence, Rhode Island
MACTEC Project No. 3650050041.14

Dear Mr. Martella:

This letter presents the proposed design for Active Soil Depressurization (ASD) at the Former Gorham Manufacturing Facility, Parcel A Retail Complex, 333 Adelaide Avenue, Providence, Rhode Island. Installation and start-up of ASD is to be competitively bid to remediation subcontractors in April 2008 by MACTEC Engineering and Consulting, Inc. (MACTEC). Bid award, submittal preparation and review, and construction activities will immediately follow on an accelerated schedule with system startup in June 2008.

Background

The existing retail complex was constructed at the site in 2001 and was opened for retail business in 2002. Currently, only one of the four spaces of the retail complex is occupied by a check-cashing service. The former video store, Dollar Store, and Stop & Shop retail spaces are unoccupied.

MACTEC conducted recent investigation activities at the Site that evaluated current conditions of soil, soil gas, groundwater and indoor air. Results of these investigation activities are described in previous submittals to Rhode Island Department of Environmental Management (RIDEM) dated August 22, 2007, November 5, 2007 and December 4, 2007.

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Based on these investigation results, MACTEC proposes installation of an ASD system at the Parcel A Retail Complex. The following paragraphs present design activities and permit evaluations conducted for the ASD system.

Pre-design Activities Conducted

On November 19, 2007, MACTEC personnel conducted a communication test within sub-slab soils of the Stop & Shop retail space. The objective of communication test was to evaluate the potential radius of influence of a single sub-slab soil vapor extraction point. The test involved drilling a two-inch extraction hole through the concrete floor slab (approximately 5 inches thick) at a central location within the retail space to serve as an extraction point, with communication test points consisting of one-half-inch holes drilled through the floor slab at varying distances (ten, twenty, and forty feet) from the extraction point. To impart a vacuum at the extraction point, both a radon fan (Fantech Model FR150) and commercial shop vacuum (Rigid, 6.5 HP, 16-gallons) were placed over or within the extraction point hole. During soil vapor extraction, several sources of smoke (e.g., smoke tubes) were used at the communication test points to provide a qualitative assessment of the radius of influence of the extraction point. Results of the communication testing indicated that the soils immediately beneath the building floor slab are extremely dense, as all communication test results indicated no movement of the generated smoke into the communication testing points.

Results of this initial communication testing effort indicated the potential for poor extraction point sub-slab communication due to the apparently tight, fine-grained sub-slab fill material. Consequently, further investigation to determine the extent of such material, both horizontally and vertically, was warranted.

On January 8 and 9, 2008, MACTEC completed five soil borings (SB-1 through SB-5, Figure 1) within the Stop & Shop retail space for classification of the sub-slab soil above the water table to obtain information regarding the extent of the fine-grained sub-slab fill material. This would indicate whether sub-slab soil depressurization should occur from a greater depth than that employed during communication testing, or whether alternative approaches to ASD system installation would be necessary. The soil boring logs (Attachment A) indicate the shallow sub-slab soils consist of tight, fine-grained materials. Based upon the vertical extent of these materials MACTEC completed the soil borings as vacuum extraction/monitoring wells by installing vertical 1-inch diameter steel wells, with screens from 5 to 10 feet below the slab.

MACTEC subsequently conducted an ASD pilot-study by applying a vacuum at SB-1 and measuring the vacuum imparted at the other locations using a manometer, which reads both pressure (positive values) and vacuum (negative values) at a precision of 0.01 inches of water column (in. W.C.). The vacuum was imparted at SB-1 using a Fantech Model FR150 radon fan connected to a 4-inch diameter polyvinyl chloride (PVC) pipe and sealed at the floor slab using bentonite. Manometer readings for SB-2 through SB-5 were taken both before and during operation of the radon fan. Results of the pilot-test are presented in Table 1 and on Figure 2. As shown, operation of the radon fan resulted in a net increase in the vacuum imparted at SB-2 through SB-5, shown as effective vacuum in Table 1. The minimum effective vacuum measured during the pilot-study was 0.01 in. W.C. which exceeds the minimum industry standard of 0.002 in W.C. for the mitigation of sub-slab soil vapor.

Active Soil Depressurization System Design

Based upon the results of the ASD pilot study, MACTEC proposes installation of an ASD system for the main building and installation of individual ASDs for each of the three small retail units. The objective of these installations is to provide sub-slab depressurization to reduce, to the extent practicable, the migration of soil vapor contamination into the on site buildings.

Individual Retail Unit ASD System Design: The individual ASD systems proposed for the small retail units would consist of sub-slab vapor extraction systems similar to radon mitigation systems that are typically installed at residential and small commercial structures. Each ASD system would utilize a three-inch diameter PVC well point screened from 5 to 10 feet below the slab. The system construction will include three-inch diameter schedule PVC piping installed from the subsurface well point to the exterior of the building where the piping would be connected to an in-line weather-proof radon fan, and ultimately to an exhaust point. The radon fan will be a Fantech HP 220, or equivalent. The exhaust point would be located a sufficient distance from all windows, doors, heating and ventilation systems, and other exhaust points, as described below. Each of these ASD systems will include a riser pipe-mounted vacuum gauge to indicate vacuum at the extraction point, alarm light (for quick visual determination of whether the system is operating), and power control switch. One vacuum extraction monitoring well would be installed in each of these smaller retail units to allow monitoring of sub-slab depressurization performance. These monitoring points would be located at the farthest distance from the extraction point within the retail units.

Note that the ASD system for the check cashing service unit is located along the western wall of the former Stop & Shop building. The extraction well is located to provide vapor mitigation to the small retail unit while allowing the easier installation of the well and piping inside Stop & Shop. This will also minimize disturbance to the operating retail store. The individual ASD system for this store is based on the groundwater and soil gas data in this area of the site. Based on the monitoring data, this extraction well may be connected to the Stop & Shop ASD system for effluent treatment as discussed below.

The ASD exhaust points will be located a minimum of one foot above the roof-line, and be a minimum of 10 feet away from windows, doorways, or other openings that are less than 2 feet below the discharge point and 10 feet away from any adjacent or attached buildings and any Heating, Ventilation, and Air Conditioning (HVAC) or other intakes. These minimum setbacks are consistent with common industry standards.

Main Building ASD System Design: The proposed ASD system for the main building would utilize a regenerative blower, rather than individual radon fans, to draw a vacuum from multiple extraction points. The main building ASD system would include a weather-proof system enclosure, either pre-fabricated or constructed on site, for installation near the northwest corner of the Stop & Shop building, which would house the regenerative blower, a vapor discharge treatment system, and other controls and equipment associated with the system. A piping and instrumentation diagram of the main building ASD systems is shown on Drawings D-601 and D-001.

Drawing C-101 presents a schematic of the proposed main building ASD system extraction well and piping layout. Actual extraction well and piping locations would be determined following a pre-construction site inspection. Results of the pilot-scale indicated that an individual extraction well was capable of imparting an effective vacuum of up to 0.036 in W.C., at a distance of 80 feet. The minimum measured effective vacuum (0.01 in. W.C. recorded at location SB-2) was measured at a distance of 50 feet from SB-1. On this basis, the design includes a vacuum extraction well spacing based upon a 50-foot radius of influence for extraction wells located with the main building. The highest soil vapor concentrations are within the western half of the main building, and, furthermore, within the front two-thirds of the western half. As such, four extraction wells are proposed within the main building as depicted in Drawing C-101. All vacuum extraction wells would consist of a two- or three-inch diameter PVC well with a five-foot screened interval from 5 to 10 feet below the slab.

The proposed ASD system piping would consist of two- or three-inch diameter PVC riser pipe extending from each of the subsurface well points to below the grade of the floor slab, where, within a one-foot diameter flush mounted well vault, the piping would increase in size (if necessary) to three-inch diameter PVC and elbow to a short horizontal sub-slab pipe run to the side of an existing building column or other structural component (Detail A, Drawing C-501). A sampling/monitoring port would be installed within each well vault to allow for monitoring of vacuum and flow at each extraction well (Detail B, Drawing C-501). The extraction pipe risers would then extend to above the hanging ceiling. Once above the hanging ceiling, a 90-degree three-inch PVC elbow would transition the extraction piping from vertical to horizontal.

Horizontal riser piping would consist of three-inch diameter PVC pipe connected to the existing ceiling structure using pipe hangers. The horizontal pipe runs would extend to the back of main building, pass through the exterior wall, and enter the ASD system enclosure (Detail E, Drawing C-501). Within the ASD system enclosure, each of the four influent pipes would manifold to a single four-inch diameter PVC pipe. Each of the four influent pipes, prior to the manifold, would have individual ball valves for throttling of individual extraction wells, and access ports to allow for sampling and measurement of the influent from each extraction well.

The influent in the four-inch PVC diameter piping would pass through an air/water separator to remove condensation and a particulate filter before reaching the regenerative blower. The regenerative blower performance will meet a minimum of 25 standard cubic feet per minute (scfm) per well at 12 in. W.C. at the extraction well (plus any losses in pipeline). On the exhaust side of the regenerative blower, the extracted soil vapor would initially pass through a vapor treatment system consisting of two granular activated carbon (GAC) filters in series. The GAC filters will be connected using flexible hoses and bypass valves to allow for GAC filter change outs. As further discussed below, this initial use of GAC filters is being proposed as a proactive measure to address anticipated elevated effluent concentrations on startup. The main building ASD final discharge point would meet the minimum setback requirements described above.

Existing well points at SB-1 through SB-5 would be utilized as vacuum extraction monitoring wells to monitor extraction point communication through vacuum measurements and allow for collection of subsurface soil vapor concentrations. Additional vacuum extraction monitoring wells will be installed, as necessary, to provide a complete monitoring network.

Operation, Maintenance, and Monitoring Requirements

An evaluation of the soil vapor data suggests that it is prudent to treat emissions from the main building ASD system by GAC for removal of volatile organic compounds (VOCs) during the start-up phase. VOC emissions during the start-up phase would be expected to decline rapidly and are expected to be well below any air permitting thresholds within a relatively short time, thereby negating the need for long-term emission treatment and the application for an air pollution control permit. The air permitting thresholds considered relevant in this situation include those outlined in RIDEM's *Air Pollution Control Regulation No. 9, Air Pollution Control Permits* (last amended July 19, 2007), which, at section 9.3 establishes thresholds that trigger the requirement for a Minor source permit. These threshold criteria include:

- Any stationary source that emits or has the potential to emit, in the aggregate, 25 tons per year or more of any combination of hazardous air pollutants (criterion 9A); or
- Any stationary source that has the potential to increase emissions of a listed toxic air contaminant by greater than the minimum quantity for that contaminant, as specified in Appendix A of Regulation No. 9 (criterion 9B); or
- Any stationary source or process except for those outlined in subsections 9.3.1(a), (b), or (d) having the potential to emit one hundred pounds or more per day, or ten pounds or more per hour of any air contaminant or combination of air contaminants into the atmosphere…, (criterion 9C).

The untreated (sampled upstream of treatment unit) and treated emissions of the main ASD system and the untreated emissions of the other ASD systems will be monitored to evaluate effectiveness of the treatment and conditions relative to RIDEM air permitting thresholds. It is expected the emissions treatment unit would accomplish at least 95% removal efficiency and therefore would not require an air permit per section 9.3.2(a)(3) of *Air Pollution Control Regulation No. 9, Air Pollution Control Permits* (last amended July 19, 2007). If monitoring indicates that emissions of one or more of the individual retail unit ASD systems has the potential to trigger one or more of the RIDEM permitting thresholds, that ASD extraction point would be connected to the main ASD system in order to treat those emissions prior to final discharge. The proposed monitoring locations, frequency and analytical parameters are as follows:

- Start-up testing would be conducted for each individual extraction well within 30 minutes of start-up of the ASD system. This testing would consist of initial extraction well vacuum measurements, photoionization detector (PID) readings, and sampling and analysis of the untreated vapor, as well as sampling and analysis of the treated final ASD system discharge. Collection and analysis of the vapor samples would be conducted using 20 minute, 1-liter SUMMA®-type air canisters, submitted for VOCs analysis by U.S. Environmental Protection Agency (USEPA) Method TO-15 SIM. This data will be available within approximately five business days.

- Subsequent monitoring would be conducted to compare with RIDEM permitting threshold standards, to determine when treatment of extracted vapor is no longer necessary, and to support adjustments to the ASD system extraction to increase or decrease the extraction rate at individual extraction wells based upon contaminant concentrations. Monitoring would include sampling for VOCs using SUMMA®-type air canisters, as well as recording of PID readings, at the extraction well sampling ports, as well as vacuum measurements at the vacuum extraction monitoring wells (locations SB-1 through SB-5). This monitoring will be conducted weekly for the first four weeks of operation, monthly during months 2 and 3 and then quarterly.
- Indoor air VOC monitoring will be conducted in all four retail spaces weekly for four weeks after system start-up to establish indoor air quality with the mitigation system in operation (TO-15 SIM). Monitoring of the indoor air will be the same as for the system stated above.

Please feel free to contact either Greg Simpson (401-457-2635) or David Heislein (781-213-5655) with any questions you may have on the proposed ASD systems.

Sincerely,
MACTEC Engineering and Consulting, Inc.

Ryan T. Belcher
Project Engineer

David E. Heislein
Project Manager

Enclosures: Table 1
Figures 1 and 2
Drawings C-101, C-501, D-001 and D-601
Attachment A – Soil Boring Logs

cc: T. Deller, City of Providence
P. Grivers, EA Engineering, Science, and Technology
T. Regan, EA Engineering, Science, and Technology
G. Simpson, Textron Inc.
G. Wilson, Kimco Realty Corporation (including tenants)
J. Morgan, The Stop & Shop Supermarket Co. LLC
Knight Memorial Library Repository
MACTEC Project File [P:\TEXTRON\GORHAM\Stop & Shop\sub-slab system documents\Active Soil Depressurization System Design 03312008.doc]

TABLE

VACUUM TEST RESULTS IN SUB-SLAB
FORMER STOP SHOP
PROVIDENCE, RI

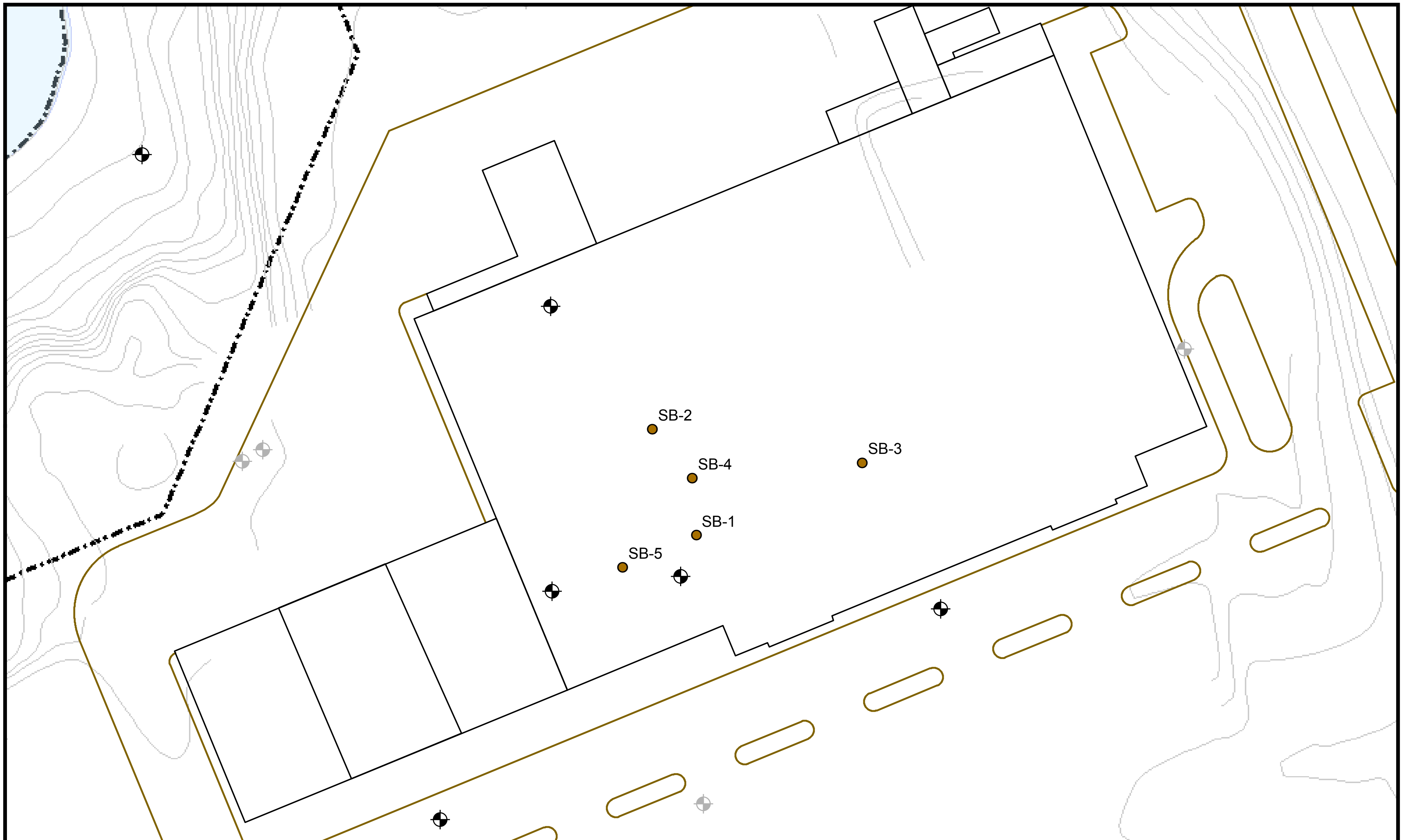
Table 1 - Sub-slab Communication Pilot Study Results

	Test 1			Test 2			Test 3			
	Observed Manometer Reading		Effective	Observed Manometer Reading		Effective	Observed Manometer Reading		Effective	Location
Well ID	(" H_20)	(" H_20)	Vacuum (" H20)	(" H_20)	(" H_20)	Vacuum (" H20)	(" H_20)	(" H_20)	Vacuum (" H20)	
SB-1	**off**	**on**		**off**	**on**		**off and plugged - 0.045**	**on**		near MW-222S
SB-2	-	-	-	-0.080	-0.090	-0.010	-0.015	-		50 ft north of SB-1
SB-3	-	-	-	-0.060	-0.096	-0.036	-0.020	-		80 ft east of SB-1
SB-4	+0.040	-	-	-0.040	-0.075	-0.035	-0.012	-0.040	-0.028	25 ft northeast of SB-1
SB-5	+0.015	-0.035	-0.050	+0.010	-0.020	-0.030	-0.010	-		35 ft west of SB-1

Prepared by: PJM
Checked by: RTB

Notes:
1. Positive values indicate positive pressure; negative readings indicate vacuum.
2. Effective vacuum is difference between manometer reading with and without vacuum imparted at SB-1. Negative value indicate additional vacuum imparted by vacuum extraction.
3. Fantech Model FR150 used to impart vacuum at SB-1. Fan specs: 115V, 60 Hz, 67 W, 0.58 Amps, 230 cfm @ 0.2 "WG. SB-2 through SB-5 used as vacuum monitoring wells.
4. All wells screened at 5 - 10 ft below bottom of concrete slab.
5. Screen and riser - 1" diameter steel.

FIGURES AND CONSTRUCTION DRAWINGS



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Note:
All soil borings were completed as vacuum extraction / monitoring wells.

N

0 30 60 Feet

Prepared by BJR | Checked by RTB

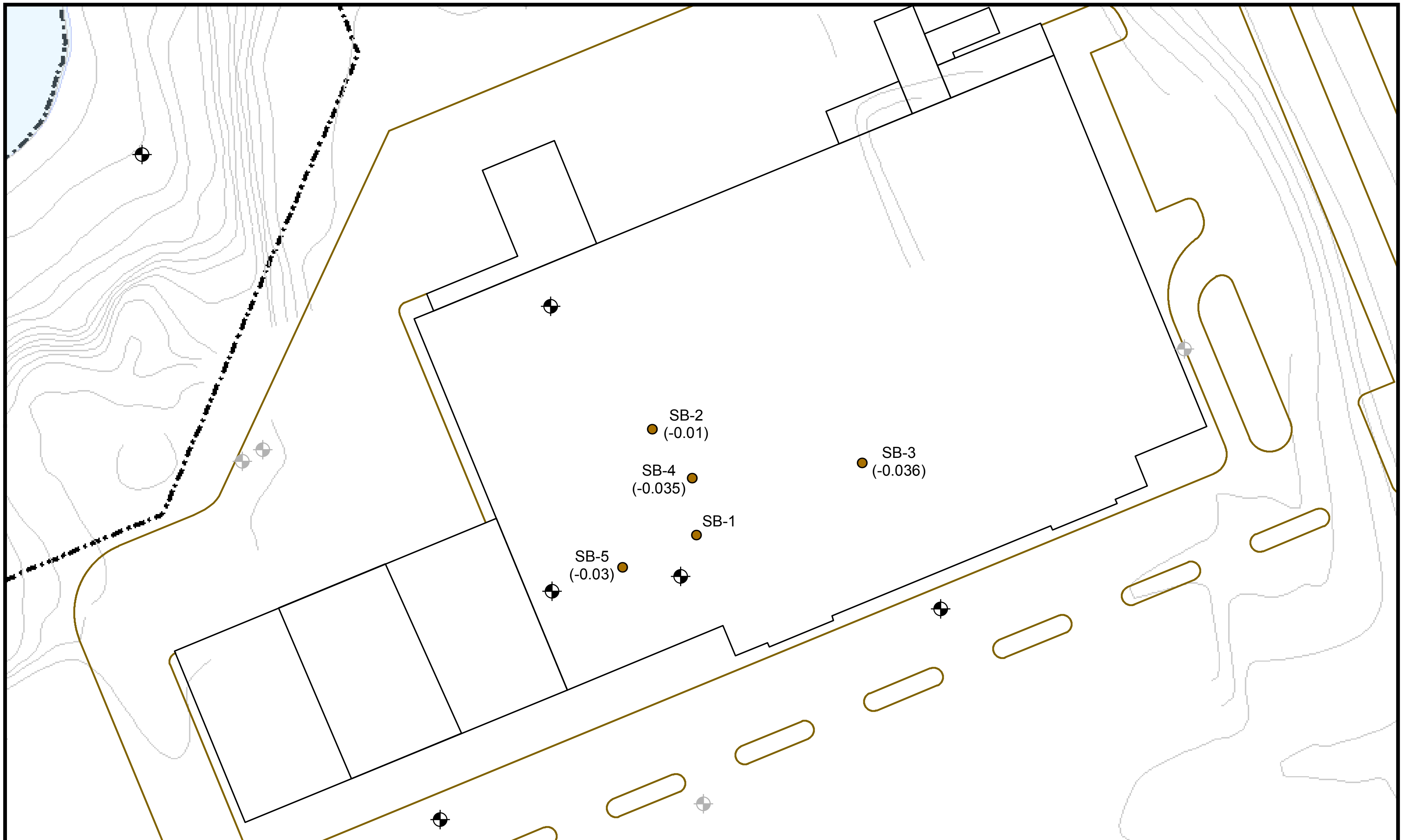
Legend

- Soil Boring
- Historical Monitoring Well
- Current Monitoring Well
- Current Building
- Pavement Outline
- Elevation

Figure 1
Location of Soil Borings

Retail Complex
333 Adelaide Avenue
Providence, Rhode Island

Document: P:\TEXTRON\GORHAM\GIS\MapDocuments\StopShopVI.mxd PDF: P:\TEXTRON\GORHAM\Stop & Shop\sub-slab system documents\Figure 1 - Location of Soil Borings.pdf 01/25/2008 1:43 PM bjroden



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Note:
Results shown are manometer readings taken during vacuum extraction at vacuum well SB-1. All values are effective imparted vacuum in inches of water column

N

0 30 60 Feet

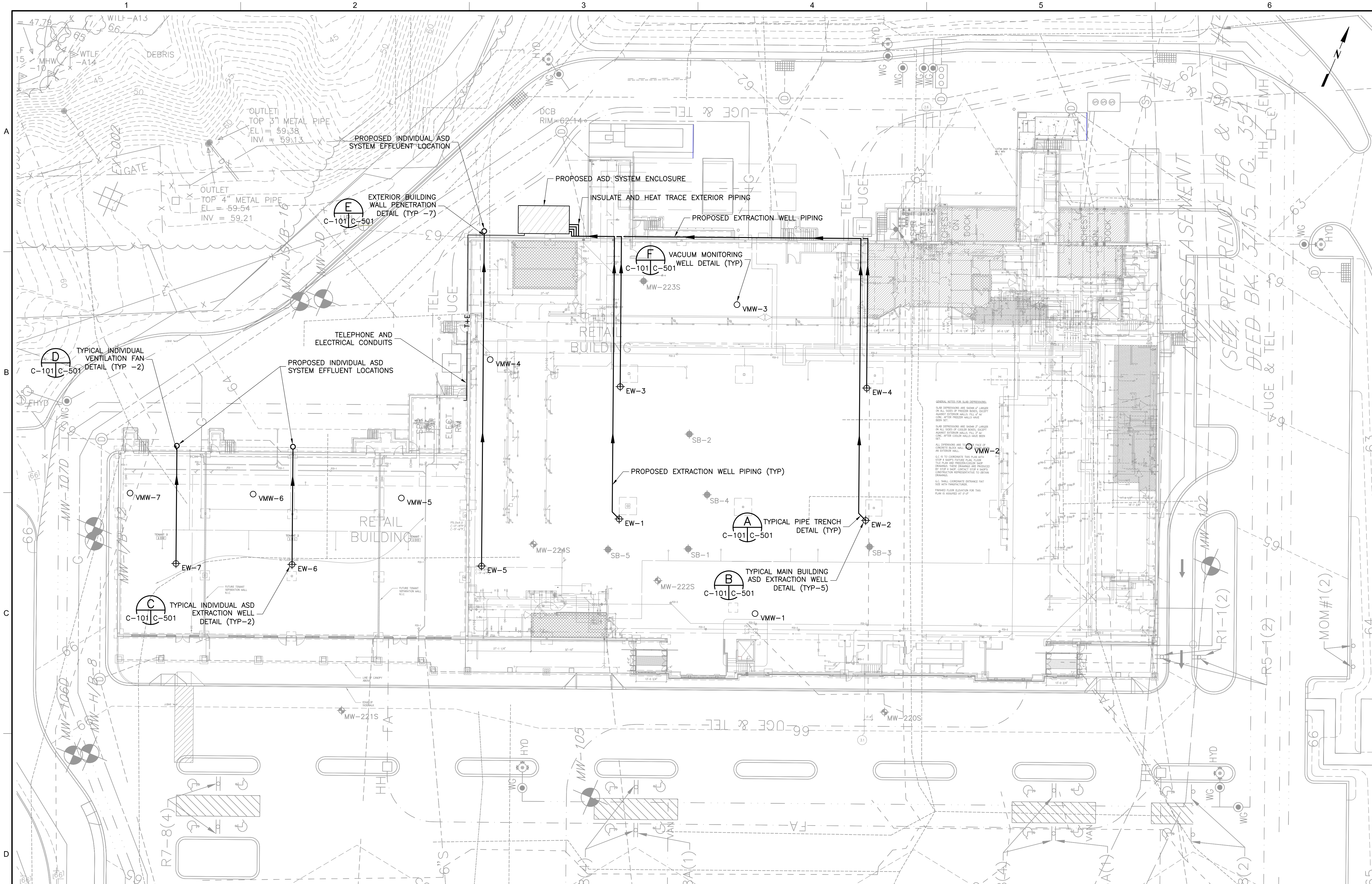
Legend

- Vacuum Well
- Historical Monitoring Well
- Current Monitoring Well
- Current Building
- Pavement Outline
- Elevation

Prepared by BJR | Checked by RTB

Figure 2
Test 2 Results

Retail Complex
333 Adelaide Avenue
Providence, Rhode Island



DRAWING REFERENCES:

1. PROPOSED GRADING, DRAINAGE, SEDIMENTATION, AND EROSION CONTROL PLAN DRAWING C-4, FOR CONSTRUCTION AUGUST 24, 2001. DRAWING C-4 MATERIALS AND UTILITIES PLAN SEPTEMBER 07, 2001, PREPARED BY VANASSE HANGEN BRUSTLIN, INC. FOR CHURCHILL & BANKS MASHAPAUG COMMONS PROVIDENCE, RHODE ISLAND

2. SUPER STOP & SHOP – #733 DRAWINGS LATEST REVISION JUNE 07, 2007 PREPARED BY: CARTER BURGESS, CAMBRIDGE, MASSACHUSETTS FOR CHURCHILL & BANKS MASHAPAUG COMMONS PROVIDENCE, RHODE ISLAND

NOTES:

1. FINAL EXTRACTION WELL AND EXTRACTION WELL PIPING LOCATIONS TO BE BASED UPON PRE-CONSTRUCTION SITE INVESTIGATION AND AS APPROVED BY THE ENGINEER AND OWNER.

2. EXTRACTION WELL PIPING SHALL BE SLOPED TO DRAIN TO EXTRACTION WELLS OR THE ASD SYSTEM ENCLOSURE.

LEGEND:

SB-5	VACUUM MONITORING WELL
MW-224S	GROUNDWATER MONITORING WELL
EW-7	PROPOSED EXTRACTION WELL
VMW-1	PROPOSED VACUUM MONITORING WELL (ACTUAL LOCATION SUBJECT TO CHANGE)

0 10 20 40
SCALE IN FEET

NO.	DATE	REVISION	BY	APVD
B	04/01/08	SUBMITTAL TO RIDEM	SCP	DEH
A	02/04/08	DRAFT FOR CLIENT REVIEW	SCP	DEH

DSGN	DR	CHK	APVD
RTB	DEL	SCP	DEH

Active Soil Depressurization System Design
Former Gorham Manufacturing Facility
Parcel A Retail Complex
333 Adelaide Avenue, Providence, Rhode Island

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Portland, Maine 04112-7050
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Civil
EXISTING CONDITIONS PLAN AND PROPOSED LAYOUT

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	
PROJ	3650050041
DWG	C-101
SHEET	2 OF 5

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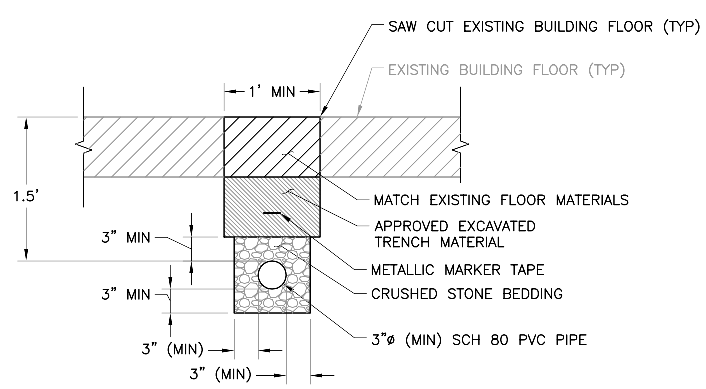
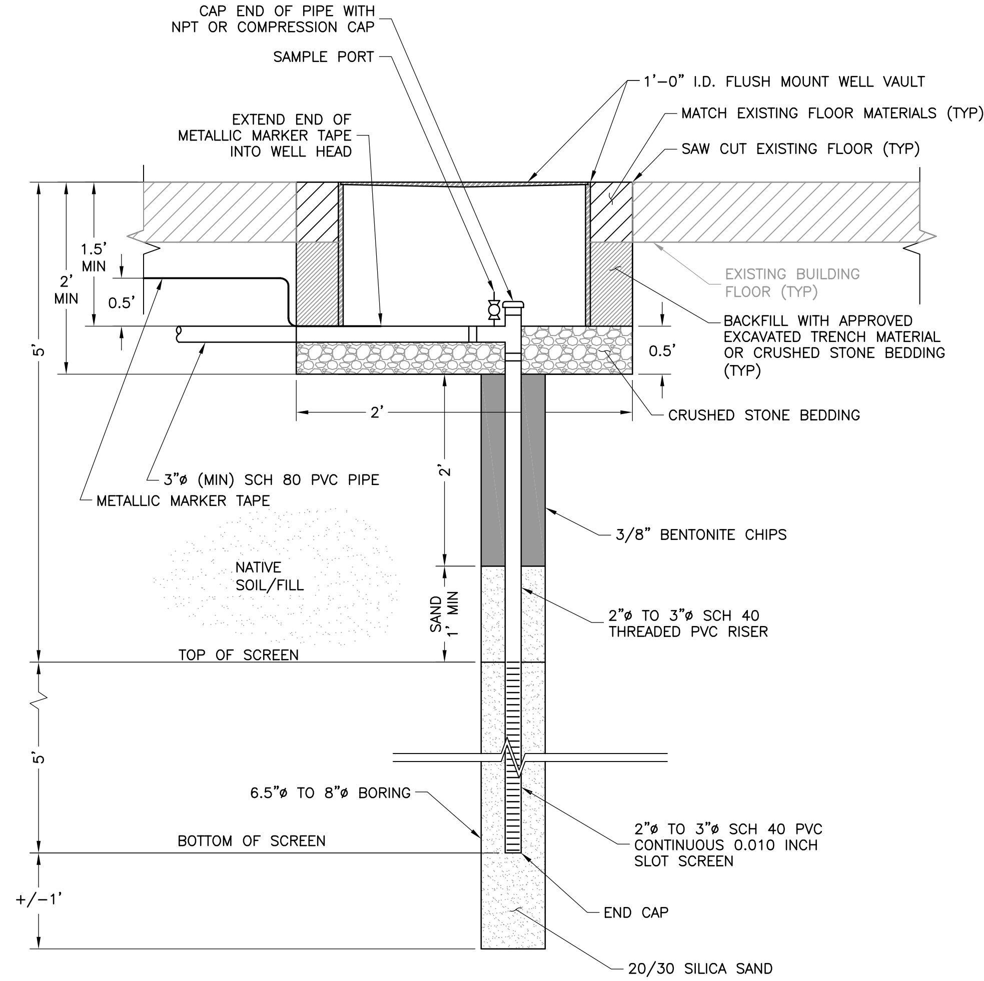


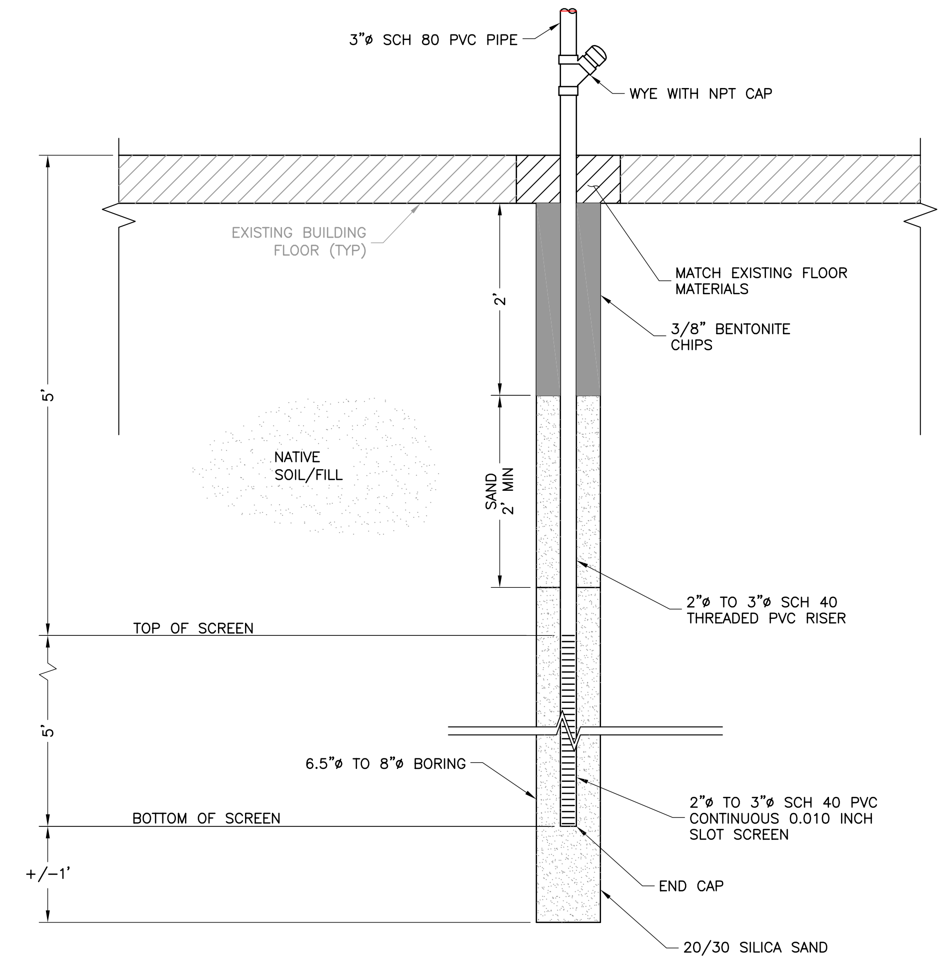
NOTES:

1. BACKFILL WITH APPROVED EXCAVATED TRENCH MATERIAL.
2. SLOPE SVE PIPE DOWN TOWARD SVE WELLS.
3. SVE PIPE TO BE SIZED BY CONTRACTOR.

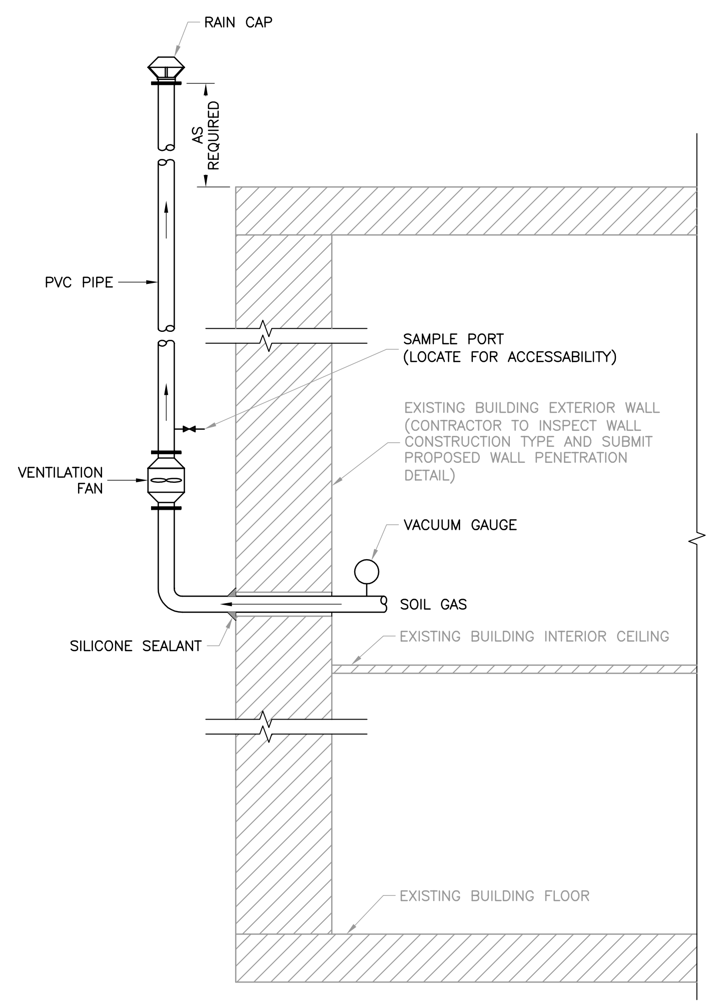
TYPICAL PIPE TRENCH DETAIL (A)
NTS
C-101 | C-501



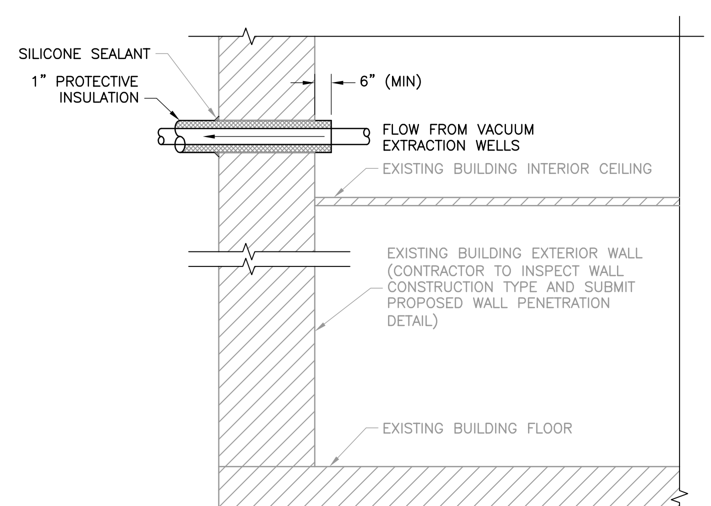
TYPICAL MAIN BUILDING ASD EXTRACTION WELL DETAIL (B)
NTS
C-101 | C-501



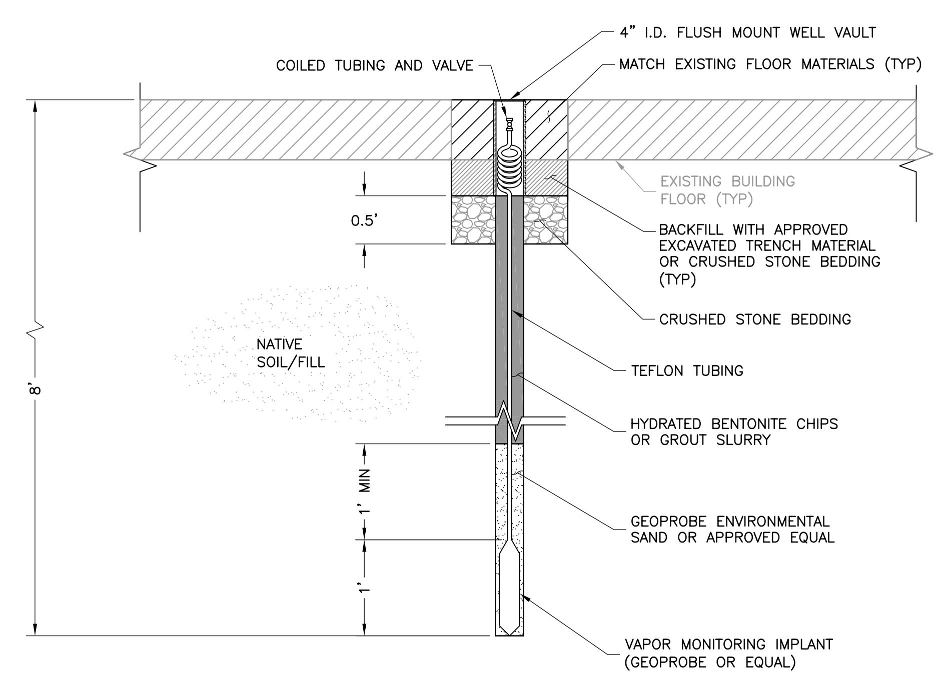
TYPICAL INDIVIDUAL ASD EXTRACTION WELL DETAIL (C)
NTS
C-101 | C-501



TYPICAL INDIVIDUAL VENTILATION FAN DETAIL (D)
NTS
C-101 | C-501



EXTERIOR BUILDING WALL PENETRATION DETAIL (E)
NTS
C-101 | C-501



VACUUM MONITORING WELL DETAIL (F)
NTS
C-101 | C-501

NO.	DATE	REVISION	BY	APVD
B	04/01/08	SUBMITTAL TO RIDEM	SCP	DEH
A	02/04/08	DRAFT FOR CLIENT REVIEW	SCP	DEH

DSGN	DR	CHK	APVD
RTB	DEL	SCP	DEH

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(207) 775-5401

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CIVIL
CIVIL DETAILS

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	
PROJ	3650050041
DWG	C-501
SHEET	3 OF 5

EQUIPMENT SYMBOLS

	CENTRIFUGAL PUMP
	SUBMERSIBLE PUMP
	ROTARY LOBE VACUUM PUMP
	LIQUID RING VACUUM PUMP
	WELL PUMP
	METERING PUMP
	AIR ACTUATED DIAPHRAGM PUMP
	FAN OR BLOWER
	MIXER OR AGITATOR
	AIR INTAKE FILTER
	AIR COMPRESSOR
	PROGRESSIVE CAVITY PUMP

EQUIPMENT ABBREVIATIONS

AC	AIR COMPRESSOR
AD	AIR DRYER
B	BLOWER
BL	BOILER
C	CLARIFIER
E	EDUCTOR
EW	EXTRACTION WELL
F	FILTER
FP	FILTER PRESS
H	HEATER
LC	LIQUID CARBON
M	MIXER
MP	METERING PUMP
OC	ORGANIOCLAY
P	PUMP
S	SEPARATOR
SA	SAMPLE VALVE
SC	SCRUBBER
ST	STACK
T	TANK
TO	THERMAL OXIDIZER
VC	VAPOR CARBON
WS	WATER SOFTENER

VALVE AND ACTUATOR SYMBOLS

	GATE VALVE OR ANY IN-LINE BLOCK VALVE NOT IDENTIFIED BY TYPE
	GLOBE VALVE
	CHECK VALVE
	BALL VALVE
	BUTTERFLY VALVE
	BALL VALVE NORMALLY CLOSED
	SLIDE GATE VALVE
	NEEDLE VALVE
	IN-LINE PRESSURE RELIEF VALVE
	NORMALLY CLOSED VALVE
	DIAPHRAGM VALVE
	PINCH VALVE
	THREE WAY VALVE
	FOUR WAY VALVE
	ANGLE GLOBE VALVE
	PRESSURE RELIEF VALVE
	VACUUM RELIEF VALVE
	PRESSURE RELIEF VALVE WITH DRIP PAN
	AIR RELIEF VALVE
	HOSE STATION
	PLUG VALVE
	HAND ACTUATOR
	DIAPHRAGM ACTUATOR
	PRESSURE REGULATOR
	BACK PRESSURE REGULATOR
	CYLINDER ACTUATOR
	MOTOR
	SOLENOID

FITTING SYMBOLS

	Y-STRAINER
	SHOWER
	SEWER OR DRAIN
	EXPANSION JOINT
	ORIFICE PLATE
	PULSATION DAMPENER
	REDUCER
	STEAM TRAP
	FILTER STRAINER
	RUPTURE DISC (PRESSURE)
	RUPTURE DISC (VACUUM)
	HOSE COUPLING
	QUICK CONNECT HOSE COUPLING
	SIGHT GLASS
	EDUCTOR
	BACK FLOW PREVENTER
	CALIBRATION COLUMN
	DIAPHRAGM SEAL
	UNION
	FLANGE
	BLIND FLANGE

DATA SYMBOLS

	PIPING MATERIAL SPECIFICATION CHANGE
	VALVE NUMBER
X"-XXX-XXXX	LINE ID PIPING MATERIAL SERVICE DESIGNATION LINE SIZE
P-117	P&ID DWG NUMBER TO WHICH LINE TO CONTINUE P&ID INTERCONNECT REFERENCE

PIPE SERVICE DESIGNATIONS

A	AIR
BR	BACKWASH RECYCLE
BW	BACKWASH
CF	CHEMICAL FEED
CO	CONDENSATE
CW	CITY WATER
CWH	CITY WATER, HOT
DE	DECANT
DR	DRAIN
EF	EFFLUENT
FPW	FIRE PROTECTION WATER
GW	GROUNDWATER
IN	INFLUENT
OF	OVERFLOW
PS	SLUDGE PRESSATE
PW	PROCESS WATER
SAN	SANITARY SEWER
SD	SUMP PUMP
SL	SLUDGE
V	VENT
VA	VAPOR

PIPING MATERIALS DESIGNATIONS

BR	BRASS
CI	CAST IRON
CM	CORRUGATED METAL
COP	COPPER
CP	CORRUGATED POLYETHYLENE
CPVC	CHLORINATED POLYVINYL CHLORIDE
CS	CARBON STEEL
DI	DUCTILE IRON
GSP	GALVANIZED STEEL PIPE
HDPE	HIGH DENSITY POLYETHYLENE
KR	KYNAR
NY	NYLON
PE	POLYETHYLENE
PP	POLYPROPYLENE
PTFE	POLY TETRA FLUOROTHYLENE (TEFLON)
PVC	POLYVINYL CHLORIDE
RC	REINFORCED CONCRETE
RUB	RUBBER HOSE
SS	STAINLESS STEEL
VC	VITRIFIED CLAY

PIPING LINE SYMBOLS

	NEW PRIMARY FLOW
	ALL OTHER NEW
	TUBE
	SECONDARY CONTAINMENT

INSTRUMENT SYMBOLS

	LOCALLY MOUNTED
	REAR OF PANEL OR RACK MOUNTED
	FRONT OF PANEL MOUNTING (PRIMARY LOCATION)
	FRONT OF PANEL MOUNTING (AUXILIARY LOCATION)
	ALARM ACTIVATED LIGHT
	ALARM ACTIVATED HORN
	ROTAMETER
	INSTRUMENTS SHARING COMMON HOUSING
	PROCESS INTERLOCK
	SHARED DISPLAY FUNCTION (BLIND)
	SHARED DISPLAY FUNCTION (OPERATOR ACCESS PRIMARY LOCATION)
	SHARED DISPLAY FUNCTION (OPERATOR ACCESS AUXILIARY LOCATION)
	COMPUTER FUNCTION (BLIND)
	COMPUTER FUNCTION (OPERATOR ACCESS PRIMARY LOCATION)
	COMPUTER FUNCTION (OPERATOR ACCESS AUXILIARY LOCATION)
	PLC LOGIC FUNCTION (BLIND)
	PLC LOGIC FUNCTION (OPERATOR ACCESS PRIMARY LOCATION)
	PLC LOGIC FUNCTION (OPERATOR ACCESS AUXILIARY LOCATION)
H/O/A HS 24	NOTE FUNCTIONAL IDENTIFICATION INSTRUMENT/LOOP NUMBER

INSTRUMENTATION IDENTIFICATION LETTERS

	FIRST-LETTER		SUCCEEDING-LETTERS		
SYMBOL	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS	–	ALARM	–	–
B	BURNER, COMBUSTION	–	–	–	–
C	–	–	–	CONTROL	–
D	–	DIFFERENTIAL	–	–	–
E	VOLTAGE	–	SENSOR (PRIMARY ELEMENT)	–	–
F	FLOW RATE	RATIO (FRACTION)	–	–	–
G	–	–	GLASS, VIEWING DEVICE	–	–
H	HAND	–	–	–	HIGH
I	CURRENT (ELECTRICAL)	–	INDICATE	–	–
J	POWER	SCAN	–	–	–
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE	–	CONTROL STATION	–
L	LEVEL	–	LIGHT	–	LOW
M	–	MOMENTARY	–	–	MIDDLE, INTERMEDIATE
N	–	–	–	–	–
O	–	–	ORIFICE, RESTRICTION	–	–
P	PRESSURE, VACUUM	–	POINT (TEST) CONNECTION	–	–
Q	QUANTITY	INTEGRATE, TOTALIZE	–	–	–
R	RADIATION	–	RECORD	–	–
S	SPEED, FREQUENCY	SAFETY	–	SWITCH	–
T	TEMPERATURE	–	–	TRANSMIT	–
U	MULTIVARIABLE	–	MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS, VACUUM	–	–	VALVE, DAMPER, LOUVER	–
W	WEIGHT, FORCE	–	WELL	–	–
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS	–	RELAY, COMPUTE, CONVERT	–
Z	POSITION, DIMENSION	Z AXIS	–	DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	–

INSTRUMENT LINE SYMBOLS

	CONNECTION TO PROCESS OR INSTRUMENT IMPULSE LINE
	INSTRUMENT PNEUMATIC SIGNAL LINE (3-15 PSIG UNLESS NOTED OTHERWISE)
	INSTRUMENT ELECTRONIC SIGNAL LINE (CURRENT OR VOLTAGE AS NOTED ON SPEC SHEETS)
	FIELD TUBING OR CAPILLARY FOR THERMAL ELEMENTS AND PRESSURE SEALS
	INTERNAL SYSTEM LINK (SOFTWARE OR DATA LINK)
	UNGUIDED ELECTROMAGNETIC OR SONIC SIGNAL
	HEAT TRACED LINE

INSTRUMENTATION DESIGNATIONS

A/B	SELECTOR SWITCH
A/M	AUTO/MANUAL
COMB.	COMBUSTIBLES
DO	DISSOLVED OXYGEN
ES	EMERGENCY STOP
F/R	FORWARD/REVERSE
H/O/A	HAND/OFF/AUTO
H_2S	HYDROGEN SULFIDE
NH_3	AMMONIA
O_2	OXYGEN CONCENTRATION
O/C	OPEN CLOSE
OL	MOTOR OVERLOAD TRIP
O/O	ON OR OFF
ORP	OXYGEN REDUCTION POTENTIAL
pH	HYDROGEN ION CONCENTRATION
SO_2	SULFUR DIOXIDE
S/S	START STOP
S	START
TU	TURBIDITY

NOTE:

INSTRUMENT DESIGNATIONS BASED ON INSTRUMENT SOCIETY OF AMERICA, STANDARD S5.1.

NO.	DATE	REVISION	BY	APVD
B	04/01/08	SUBMITTAL TO RIDEM	SCP	DEH
A	02/04/08	DRAFT FOR CLIENT REVIEW	SCP	DEH

DSGN RTB DR DEL CHK SCP APVD DEH

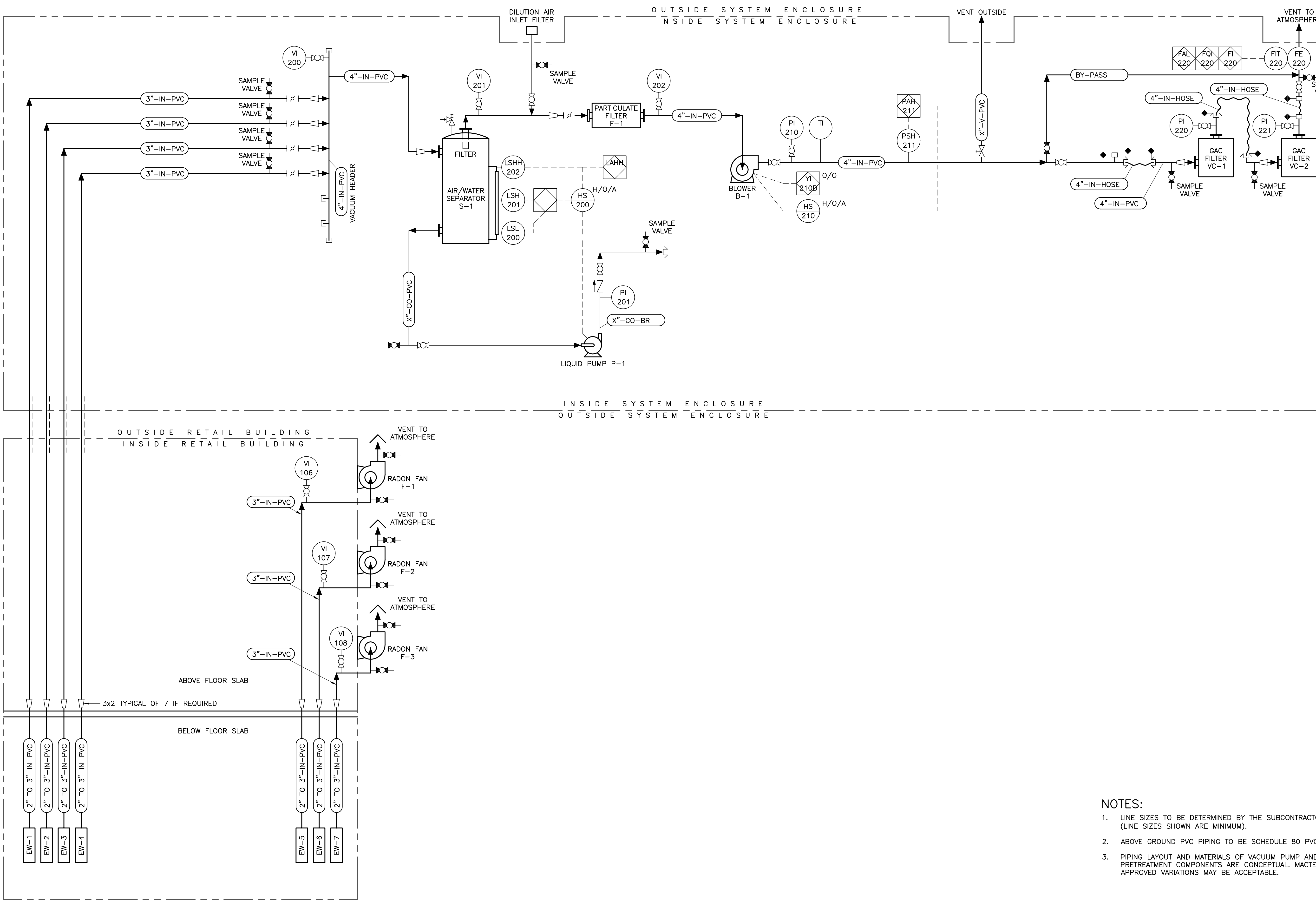
Active Soil Depressurization System Design
Former Gorham Manufacturing Facility
Parcel A Retail Complex
333 Adelaide Avenue, Providence, Rhode Island

MACTEC
MACTEC Engineering and Consulting, Inc.
P.O. Box 7050, 511 Congress Street
Portland, Maine 04112-7050
(207) 775-5401

Process
PIPING & INSTRUMENTATION DIAGRAM
LEGEND

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	
PROJ	3650050041
DWG	D-001
SHEET	4 OF 5



NOTES:

1. LINE SIZES TO BE DETERMINED BY THE SUBCONTRACTOR. (LINE SIZES SHOWN ARE MINIMUM).
2. ABOVE GROUND PVC PIPING TO BE SCHEDULE 80 PVC.
3. PIPING LAYOUT AND MATERIALS OF VACUUM PUMP AND PRETREATMENT COMPONENTS ARE CONCEPTUAL. MACTEC APPROVED VARIATIONS MAY BE ACCEPTABLE.

NO.	DATE	REVISION	BY	APVD
B	04/01/08	SUBMITTAL TO RIDEM	SCP	DEH
A	02/04/08	DRAFT FOR CLIENT REVIEW	SCP	DEH

DSGN RTB DR DEL CHK SCP APVD DEH

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MACTEC

Process
PIPING AND INSTRUMENTATION DIAGRAM

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	
PROJ	3650050041
DWG	D-601
SHEET	5 OF 5

ATTACHMENT A

Soil Boring Logs

MACTEC	Boring Location: SB-1		Page 1 of 1
	Project Name: Textron - Gorham (Stop + Shop)	Geologist:	Phil Meller
	Date Started: 1.8.08 DEH	Drilling Company:	Pine + Swallow
Soil Boring Log	Date Completed: 1 8.08 DEH	Drilling Method:	Direct Push Macro-Core
MACTEC 107 Audubon Road Wakefield, MA	Total Depth: 28'	Depth to Water:	28'
	Comments: 36500500 41.14 DEH		

Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID
0	0 - 6" olive/brown SILT and f. Sand, trace Gravel, dry 6" - 1'6" lt. brown,	(0-4') 4		—	
1	f. to coarse SAND (SW) trace Gravel (sub-rounded) dry 1'6" - 2'1"				
2	lt. brown/grey CLAY + SILT, dry 2'1" - 2'5" dk. brown f. to coarse SAND and SILT, dry				
	2'6" ~~bri~~ - 2'9" brick fragments (red), dry 2'9" - 3'2" brown/grey SILT, some		12 ppm		
3	f. Sand, dry 3'2" - 4' brown ~~coarse~~ med. to coarse SAND and GRAVEL, some		@ 3'		
4	brick fragments, dry 4 - 4'6" grey/brown f. SAND + SILT brick fragments, dry	(4'-8') 4'			
	4'6" - 5'0" brown med. to coarse SAND some Gravel, dry				
5					

Prepared by: PJM
Checked by: DEH

MACTEC	Boring Location: SB-1		Page 3 of 4
	Project Name: Textron/Gorham	Geologist:	Phil Muller
	Date Started: 1·8·08	Drilling Company:	Pine + Swallow
Soil Boring Log	Date Completed: 1·8·08	Drilling Method:	Direct Push
MACTEC 107 Audubon Road Wakefield, MA	Total Depth: 28'	Depth to Water:	28'
	Comments: 3650050041.14 DEA		

	Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID
5		5'-7' tan/brown ~~SI~~ (pm) f. to med. SAND, and SILT, trace Gravel		17ppm		
6				@ 6'		
7		7'-7'6" lt. brown/tan f. to coarse SAND, loose, dry				
		7'-6"-8' lt. brown/tan f. SAND Some Silt, trace Gravel, dry				
8		8'-8'6" grey/brown f. SAND and SILT, trace Gravel, dry	(8-12') 4'			Comments: obstruction @ 8'5", 15 min of drilling to get past obstruction
		(pm) 8'6"-~~to 8'10"~~ 9'3" lt. brown/tan, f. to coarse SAND, trace Gravel, dry ~~8'10"-9'3"~~ (pm)		8 ppm		
9		9'3"-12' lt. brown med. to coarse SAND, Some Gravel, dry		@ 9'		

Prepared by: PJM
Checked by: DEA

MACTEC

Soil Boring Log

MACTEC
107 Audubon Road
Wakefield, MA

Boring Location:	SB-1		
Project Name:	Textron-Gorham	Geologist:	Phil Muller
Date Started:	1.8.08	Drilling Company:	Pine + Swallow
Date Completed:	1.8.08	Drilling Method:	Direct Push
Total Depth:	28'	Depth to Water:	28'
Comments:	36500500 41.14 DEA		

Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID
12	12-13' grey/lt. brown f. to coarse SAND, trace Gravel, dry	(12-16') 4'			
13	13'-15' tan, f. SAND (SP), dry		14ppm @ 14'		
15	15-16' lt. brown, f. to coarse SAND and GRAVEL, dry				
16	16-17' Same as 15-16' bgs	(16-20') 4'			
17	17-20' white w/ black flecks, med. SAND (SP), ~~trace~~ PM dry		5ppm @ 19'		
20	20'-21' 9" brown/grey, f. to coarse SAND, trace Gravel, dry 21' 9" - 24'	(20-24) 4'	7ppm @ 22		
22	white/grey f. SAND (SP) dry				
24					

Prepared by: PJM
Checked by: DEA

MACTEC	Boring Location: SB-1		Page 1 of 1
	Project Name: Textron - Gorham	Geologist:	Phil Muller
	Date Started: 1.8.08	Drilling Company:	Pine + Swallow
Soil Boring Log	Date Completed: 1.8.08	Drilling Method:	Direct Push
MACTEC 107 Audubon Road Wakefield, MA	Total Depth: 28'	Depth to Water:	28'
	Comments: 3650050041.14 DEA		

Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID
24	24'-26' grey / lt. brown, f. to med SAND, trace Gravel, dry	(24-28') 4' ~~7 pp~~ (ppm)	7 ppm		
26	26-27'-6" ~~f.~~ white/grey, ~~SA~~ f. SAND, dry 27'6"-28' grey / tan f. SAND, moist		@ 26'		
28	28' end of boring				

Prepared by: PJM
Checked by: DEA

MACTEC	Boring Location: SB-2		Page 1 of 1
	Project Name: Textron - Gorham	Geologist:	Phil Muller
	Date Started: 1-8-08	Drilling Company:	Pine + Swallow
Soil Boring Log	Date Completed: 1-8-08	Drilling Method:	Direct Push
MACTEC 107 Audubon Road Wakefield, MA	Total Depth: 28'	Depth to Water:	27'
	Comments: 3650050041.14 DEA		

Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID
0	0 – 1'2" olive/grey SILT and f. SAND, dry 1'2" – 2' olive/grey f. SAND, some	(0-4') 4'	3 ppm		
2	Silt, dry, trace Gravel 2'–4' olive/grey SILT, some f. Sand, trace Gravel, dry		@ 2'		
4	4-5'6 lt. brown, f. to coarse SAND and GRAVEL, trace SILT, wood piece, dry	(4-8') 4'	18 ppm		
6	5'6 – 6' lt. brown/grey SILT, dry 6' - 8 lt brown, f. to coarse SAND		@ 6'		
8	some SILT, some Gravel, dry 8 - 8'8" same as 6-8' 8'-8" – 10'7" ~~lt~~ PM lt. brown,	(8-12') 4'			
9	f. to coarse SAND, dry 10'7" – 11'2" lt. grey f. SAND, dry		10 ppm		
11	11'2" – 12' lt. brown, f. to coarse SAND, dry		@ 11'		
12					

Prepared by: PJM
Checked by: DEA

MACTEC	Boring Location: SB-2		Page ~~1~~ 2 of 1
	Project Name: Textron. Gorham	Geologist:	Phil Miller
	Date Started: 1.8.08	Drilling Company:	Pine + Swallow
Soil Boring Log	Date Completed: 1.8.08	Drilling Method:	Direct Push
MACTEC 107 Audubon Road Wakefield, MA	Total Depth: 28'	Depth to Water:	27'
	Comments: 3450050041.14 DEA		

Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID
12	12'6" – 13'3" lt. brown/~~lt~~ olive, f. SAND and ~~Some~~ SILT, trace Gravel, dry 13'3" – 13'8" lt. brown/tan/white,	(12–16') 4' top 6" slough			
14	med. to coarse SAND, dry 13'8' – 16' lt. brown/grey, f. to med. SAND, dry (white + black		15 ppm @ 15'		
16	flecks) 16' – 17'10" lt. brown, f. to med. SAND, trace coarse sand + gravel, trace silt	(16 – ~~18~~ 20') 4'	18 ppm @ 17'		
18	17'10" – 18'10" lt. grey, f. to med. SAND, dry 18'10" – 20' ~~lt~~ grey, f. SAND, dry				
20	20' – 21'8" lt. brown, f. to coarse SAND Some Gravel 21'8' – 24	(20–24') 4'	7 ppm @ 23'		
24	lt. grey, v.f. SAND, dry 24 – 25'10" lt. brown, med. to coarse SAND, dry	(24–28') 4'	38 ppm		
26	26' – 28' lt. brown, grey f. SAND, wet Some orange f. SAND streaks (dk grey color 27–28' bgs)		@ 26'		
28					

END OF BORING @ 28'

Prepared by: PJM
Checked by: DEA

MACTEC	Boring Location: SB-3		Page 1 of 1
	Project Name: Textron-Gorham	Geologist:	Phil Muller
	Date Started: 1.8.08	Drilling Company:	Pine & Swallow
Soil Boring Log	Date Completed: 1.8.08	Drilling Method:	Direct Push
MACTEC 107 Audubon Road Wakefield, MA	Total Depth: 12'	Depth to Water:	—
	Comments: 3650050041.14 DEA		

Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID
0	0 – 3' 1" olive/grey SILT, (wood ~~fra~~ piece @ 0' and brick fragment @ 2'2") dry	(0-4') 4'	15 ppm @ 2'		
3	3' 1" – 4 : lt. tan, v.f. SAND, dry				
4	~~lt brown~~ PM 4' – 8 lt. brown, f. to med SAND, trace Gravel, dry (brick fragment @ 6')	(4-8') 4'	12 ppm @ 6'		
8	8 – 8'5" slough 8'5" – 9'8" lt. brown/grey, f. to med	(8-12') 4'			
9	SAND, trace Gravel, dry trace brick fragments (Silt lens @ 9'8") 9'8" – 10'5"				
10	lt. grey/tan, f. to coarse SAND, loose, trace Gravel dry 10'5" – 10'9" dk brown, ~~fil~~ FILL (brick)	~~11 ppm @~~ PM	11 ppm @ 10'		
11	10'9" – 11'4" grey, f. SAND, dry 11'4 – 12' lt tan/white v.f. to				
12					

f. SAND, loose, dry
END OF BORING @ 12'

Prepared by: PJM
Checked by: DEA

MACTEC	Boring Location: SB - 4	Page 1 of 1
Soil Boring Log	Project Name: Textron - Gorham	Geologist: Phil Muller
MACTEC 107 Audubon Road Wakefield, MA	Date Started: 1·8·08	Drilling Company: Pine + Swallow
	Date Completed: 1·8·08	Drilling Method: Direct Push
	Total Depth: 12'	Depth to Water: —
	Comments: 3650050041.14 DEH	

Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID
0	0 - 6" lt brown/grey, SILT, some f. Sand, trace Gravel, dry 6" - 1'10"	(0 - 4') 4'			
1	brown and dk. brown, f. to med. SAND, trace Gravel, dry 1'10" - 3' grey/olive f. SAND and SILT		14 ppm		
2	dry		@ 2'		
3	3' - 4 grey/olive SILT				
4	4' - 8' lt brown/grey SILT, trace f. Sand	(4 - 8') liner was damaged, recovery is uncertain	17 ppm @ 6'		
8	8' - 12" brown med. to coarse SAND, dry, trace Gravel	(8 - 12') 4'	12 ppm		
10			@ 10'		
12					

END OF BORING @ 12'

Prepared by: PJM
Checked by: DEH

P:\ADMINISTRATIVE\FORMS\Field Forms\boring log blank.xls

MACTEC	Boring Location: SB-5		Page 1 of 1
	Project Name: Textron - Gorham	Geologist:	Phil Muller
	Date Started: 1-9-08	Drilling Company:	Pine + Swallow
Soil Boring Log	Date Completed: 1-9-08	Drilling Method:	Direct Push
MACTEC 107 Audubon Road Wakefield, MA	Total Depth: 11'	Depth to Water:	—
	Comments: 3650050041.14 DEA		

	Depth (feet)	Stratigraphy Description	Penetration/ Recovery (feet)	Headspace (ppm)	Blows/ 6 inches	Sample ID
0		0-6" olive/brown f. SAND and SILT, trace Gravel, dry 6"-10" Black FILL (includes brick + granular matl.)	(0-3') 3'			
	(PM)	~~6"-10"~~ dry 10"-1'-1" tan/grey v.f. SAND, dry 1'1"-1'5"				
1		lt. brown, f. to med. SAND, trace Gravel 1'5"-2'11" tan/grey SILT, some		0 ppm		
2		med. Sand, dry 2'11"-3' tan med. SAND + GRAVEL dry		@ 2'		
3		3-7' brown SILT, some Gravel dry	(3-7') <1' obstruction			
7		7-9' brown SILT, some Sand + Gravel, dry	(7-9') <1' obstruction			
9		9-10' tan/lt. grey, med. to coarse SAND, trace Gravel, dry 10'-11' lt. brown f. SAND, dry	(9-11') 4' (2' slough)	0 ppm @ 10'		Note: 2' slough is brown f. to med SAND, trace Fill
11						

Prepared by: PJM
Checked by: DEA