Hudson Valley Research Park
2070 Route 52
Hopewell Junction, NY 12533 6531
S. C. Hawkins, Z/325

April 25, 2011

Mr. Alex Czuhanich
Engineering Geologist
New York State Department of
Environmental Conservation
Division of Environmental Remediation
Remedial Bureau E, 12th Floor
625 Broadway
Albany, New York 12233-7017

Mr. Henry Wilkie
Environmental Engineer 1
New York State Department of
Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, 11th Floor
625 Broadway
Albany, New York 12233-7015

Subject: Work Plan for Recovery Well GW-032A Replacement, Remediation Area D

Reference: IBM East Fishkill Corrective Action Program
IBM East Fishkill Facility
Hopewell Junction, New York
NYSDEC Part 373 Permit 3-1323-0025-00249-0
EPA ID No. NYD000707901

Dear Mr. Czuhanich and Mr. Wilkie:

The purpose of this letter is to transmit our proposed work plan for the replacement of recovery well GW-032A with new recovery well GW-032B, located in Remediation Area D. This remediation area is specifically addressed in the site's 6NYCRR 373 Permit (Module III.E.17 (a)). Existing well GW-032A must be replaced due to formation material entering the well, most likely from a break in the lower portion of the well screen. IBM is anxious to start this work as soon as possible because it is unknown how long GW-032A will continue to operate before complete failure. Your expedited review would be greatly appreciated.

If you have any questions regarding this submittal, please contact Jackie Braungart at (845) 892-1672.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate

and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,
International Business Machines Corporation

Steven C. Hawkins, Manager
Environmental Engineering

c: K. Brezner, NYSDEC Region 3, Regional Environmental Remediation Engineer (electronic only)
RCRA Permitting Section Supervisor, Division of Environmental Remediation, NYSDEC (Electronic only)
R. Schatz, ESDC (without enclosures)
USEPA Region 2 (electronic only)

GROUNDWATER SCIENCES CORPORATION

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625 Broadway
Albany, New York 12233-7015

Re: *Work Plan for Recovery Well GW-032A Replacement*
Remediation Area D
IBM East Fishkill Facility / Hudson Valley Research Park

Dear Mr. Czuhanich and Mr. Wilkie:

On behalf of the IBM Corporation (IBM), Groundwater Sciences Corporation (GSC) has prepared this Work Plan for replacement of existing groundwater recovery well GW-032A located within Remediation Area D of the IBM East Fishkill Facility in East Fishkill, New York (Site). Replacement of well GW-032A is necessary due to an apparent break in the lower portion of the well screen which has resulted in formation material entering the well, potentially limiting the future hydraulic effectiveness of GW-032A to maintain hydraulic containment in the Remediation Area D portion of the Site.

This Work Plan has been prepared as part of IBM's groundwater Corrective Action (CA) program which is currently regulated by the New York State Department of Environmental Conservation (NYSDEC) under the Site's New York State Part 373 permit. Specific elements of the GW-032A replacement described in this Work Plan include: Replacement recovery well drilling, construction, and development; hydraulic testing of the newly installed recovery well; decommissioning of well GW-032A; and preparation of a final report that will be submitted to NYSDEC to document the results of the field explorations and testing performed as part of the replacement and decommissioning of well GW-032A. The replacement well will be designated as GW-032B.

BACKGROUND

The Site consists of a semiconductor manufacturing and development facility located in south-central Dutchess County within the Town of East Fishkill, New York. As shown on the Site Location Map provided as Figure 1, the Site is located between Interstate 84, to the south, and New York State Route 52, to the north. Remediation Area D is located in the northwestern portion of the

Site in the area of the wastewater treatment facility, where fire training operations were conducted in the 1970s. Groundwater recovery operations have been implemented in Area D since 1982. Corrective Action implemented in Area D includes groundwater recovery from well GW-032A to hydraulically contain and remove VOC-containing groundwater from shallow perched groundwater in the area of the former fire training operations. Other CA activities performed in Area D include quarterly sampling and/or groundwater level elevation monitoring of the Groundwater Monitoring Plan (GMP)[1] wells shown on the Remediation Area D Location Map provided as Figure 2.

Groundwater recovery operations were initially performed using well GW-032. In 1998, well GW-032 had to be decommissioned and replaced with well GW-032A, located about 40 feet further to the southwest, due to the construction of a new nitrification basin as part of an expansion of the Site's wastewater treatment facility. The GW-032A well was constructed with ten feet of 4-inch inner diameter (I.D.) No. 10 slot wire-wrapped 304 stainless steel well screen along with a 5-foot 304 stainless steel sump. The bottom of the well screen was installed approximately 0.4 feet into the top of glaciolacustrine silt and clay with the remaining 9.6 feet of screen spanning alluvial sand and gravel soils. Under non-pumping conditions shallow perched groundwater within the alluvial sand and gravel soils is inferred to flow in a westerly direction from the area of the wastewater treatment plant towards Gildersleeve Brook. The locations of Area D groundwater recovery well GW-032A, former groundwater recovery well GW-032 and nearby monitoring wells are shown on Figure 2. Soil boring and well construction logs for recovery well GW-032A are provided in Appendix A.

WORK PLAN TASKS

On behalf of IBM, GSC will complete the following tasks to support replacement of groundwater recovery well GW-032A.

Task 1 - Installation of New Recovery Well GW-032B

Installation of new recovery well GW-032B to replace well GW-032A will include the following subtasks:

- Replacement recovery well siting and utility review field activities;
- Replacement recovery well drilling, construction, and development;
- Hydraulic testing of the newly installed recovery well;
- Installation of pumping system components for the newly installed recovery well; and
- Improvements to hot box pumping system controls and meters (optional subtask).

[1] Groundwater Sciences Corporation and IBM Environmental Engineering, February 1996 (revised October 1999), Groundwater Monitoring Plan, IBM East Fishkill Facility.

Task 1.1 – Replacement Recovery Well Siting and Utility Review

As shown on Figure 2, the proposed location for recovery well GW-032B is located in the area between existing groundwater recovery well GW-032A and monitoring well MW-616. The proposed drilling location was selected based on a review of:

- Alluvial sand and gravel conditions in Area D as described on soil boring and well construction logs for GW-032A, MW-614, MW-615, MW-616, and MW-757 (See Appendix A);

- Results of a1998 pumping test of GW-032A completed shortly after its construction; and

- Results of 2010 water level and water quality monitoring of GW-032A and nearby monitoring wells.

Specifically, the proposed GW-032B well location has been selected in an area anticipated to have similar soil texture conditions and saturated thickness to GW-032A that should result in similar hydraulic control of the limited VOC presence in Area D groundwater. The proposed GW-032B location is about ten to fifteen feet southeast of GW-032A to be in a position closer to wells MW-616 and MW-757 where groundwater sampling in 2010 indicates slightly higher VOC concentrations as compared to wells MW-614 and MW-615.

The scope of the utility review will consist of the following three activities:

1. GSC will stake the proposed recovery well drilling location in the field and coordinate with IBM utility representatives at the facility to assess for the presence or absence of subsurface utilities in the area of the proposed drilling location;

2. Once a final location has been approved by IBM utility personnel, GSC's drilling subcontractor Parratt-Wolff, Inc. (PWI) of East Syracuse, New York will notify the New York Underground Facilities Protective Organization (Dig Safe); and,

3. As an added factor of safety, PWI will initially advance the upper six to eight feet of the replacement well borehole by a combination of hand excavation and vacuum extraction "air-knife" methods in an effort to confirm the absence of subsurface utilities.

Task 1.2 – Replacement Recovery Well Drilling, Construction, and Development

GSC will coordinate with PWI to drill, construct and develop a replacement groundwater recovery well. Groundwater recovery operations at well GW-032A will be shutdown during drilling and well development activities. Well GW-032A groundwater withdrawals will cease at least 24 hours prior to drilling. The drilling, well construction and development activities will be performed by PWI and will be observed and logged by a GSC geologist.

The replacement wellbore will be advanced by a truck-mounted drill rig using 6 ¼-inch hollow-stem auger drilling techniques. As indicated under Task 1.1, the upper six to eight feet of the soil boring will initially be advanced using vacuum extraction "air-knife" methods. Below a depth of six to eight feet below ground surface soil samples will be collected continuously in accordance with

American Society of Testing and Materials (ASTM) Method 1586. The soil samples will be classified in the field by a GSC geologist using the modified Burmister soil classification system. Soil samples collected during drilling will be screened in the field for total VOCs using a photoionization detector (PID) equipped with a 10.6 electron volt (eV) lamp and calibrated to a 100 parts per million isobutylene in air reference standard. An example soil boring and well installation log (Field Operations Report form) is provided in Appendix B.

The extraction well will be constructed using a 5-foot section of 4-inch I.D. No. 35 slot wire-wrapped 316 stainless steel well screen along with a 5-foot 316 stainless steel sump, and approximately 13 feet of 316 stainless riser. The sump, well screen, and riser will be joined by threaded flush couplings. The bottom of the well screen will target the top of the glaciolacustrine silt and clay. The 5-foot long sump will extend below the well screen to allow for additional pump clearance. The annular space between the well screen and borehole wall will be backfilled with Morie No. 1 filter sand. The filter sand will extend about two feet above the top of the screen with the remaining borehole annulus backfilled with a bentonite chip seal. The temporary locking cap will secure the well until installation of the pitless adapter and other pumping system components are completed as part of Task 1.4 described below. The well will be protected flush with the ground surface using a concrete manhole ring and metal manhole cover.

The proposed design of well GW-032B includes a larger screen-slot size and shorter screen length than well GW-032A in an effort to improve hydraulic efficiency and well yield that may result in enhancement of the hydraulic containment in Area D. The well screen length and slot size for well GW-032B were selected based on soil textural conditions encountered at the GW-032A well location along with over a decade of GW-032A operating water level data.

The newly installed well will be developed to promote the exchange of water from the formation to the well. Well development will be performed by PWI using surge and airlift pumping techniques. During development purged fluids will be periodically screened for temperature, specific conductance, pH, and turbidity. Well development will include removal of a minimum of ten well volumes and will be performed until field screening parameters stabilize. Well development will be observed and logged by GSC. A well development field data sheet is provided in Appendix B.

The drill rig and all downhole drilling equipment will be steam-cleaned prior to arrival on-Site and upon completion of drilling, well installation, and well development activities. Steam cleaning will be performed using a temporary decontamination pad located adjacent to the well drilling location. Soil cuttings generated during drilling advancement, extraction well installation, and well development activities will be placed in DOT approved “ring-top” 55-gallon drums. In coordination with IBM, the drums will be labeled by GSC and transferred by PWI to IBM’s on-Site containerized waste storage area in Building 309. Development and decontamination fluids will be containerized and transferred at IBM’s direction to the wastewater treatment facility.

A location and elevation survey of the newly installed groundwater recovery well will be performed by Spectra Engineering, Architecture, and Surveying, P.C. of Poughkeepsie, New York. The well location will be surveyed relative to IBM’s site coordinate system and the elevations will be surveyed to the nearest hundredth of a foot relative to feet above mean sea level.

Task 1.3 – Hydraulic Testing

GSC will perform hydraulic testing of the newly installed groundwater recovery well to: document the specific capacity of the well at the time of its installation; assess potential long term well yields; assess the apparent hydraulic capture of the well; and collect groundwater quality data under representative withdrawal conditions. The GW-032A recovery well will be shutdown at least 48 hours prior to the start of hydraulic testing of the newly installed well. The testing will be performed using an electric submersible pump powered by either a generator or electrical service.

The hydraulic testing will include an initial step drawdown test to be performed within an 8 hour period. The flow rate will be determined using a totalizing flow meter. The well will be allowed to recover overnight and then a constant rate pumping test will be performed between 24 to 48 hours. The flow rate targeted by the constant rate pumping test will be determined on the basis of the results of the initial step test. During the constant rate test water levels will be monitored in the pumping well and nearby wells through a combination of manual and automated means. The nearby wells include, but may not be limited to, GW-032A, MW-614, MW-615, MW-616, MW-757, MW-782, MW-839, MW-066, MW-067, and MW-170. The length of the test will be dependent of the rate of stabilization of water levels for the pumping well and nearby wells. A water level monitoring form (Aquifer Test Data form) to be used during the constant rate test is included in Appendix B.

The pump effluent will be discharged directly to a wastewater treatment facility nitrification clarifier via temporary above-ground discharge tubing. Water quality samples for VOC analysis will be collected at up to five intervals during the constant rate pumping test; anticipated to include elapsed times of 30 minutes, 2 hours, 8 hours, 24 hours, and just before pumping test termination. Samples for a number of inorganic water quality parameters will also be collected just prior to pumping test termination to provide a baseline of general water quality conditions, including major cations and anions, prior to the start of GW-032B groundwater extraction operations. The inorganic parameters proposed for analysis include: total alkalinity as $CaCO_3$, ammonia as nitrogen, total organic carbon, chloride, fluoride, total hardness as $CaCO_3$, nitrate as nitrogen, nitrite as nitrogen, total dissolved solids, total suspended solids, sulfate, total calcium, total and dissolved iron, total magnesium, total and dissolved manganese, total potassium, and total sodium. An example chain-of-custody form is included in Appendix B.

Task 1.4 – Data Analysis and Report Preparation

The results of the field and laboratory explorations and testing will be summarized in a letter report with tabulated data summaries and figures. The report will include an interpretation of the apparent zone of hydraulic capture under new recovery well (GW-032B) withdrawal conditions and an opinion as to whether GW-032B serves as an adequate replacement to well GW-032A. The report will be submitted to NYSDEC for review and approval. GW-032A groundwater extraction operations will resume during preparation of the report and while awaiting regulatory review and approval.

Task 1.5 – Pumping System Installation and Connection

Upon IBM's receipt of approval from NYSDEC, GSC will complete field activities necessary to switch groundwater recovery operations in Area D from well GW-032A to well GW-032B. The field activities will include: shutdown of well GW-032A groundwater withdrawals; installation of a

pumping system in well GW-032B, completion of underground electrical and conveyance piping connections, and startup of GW-032B groundwater recovery operations. Specific elements of GSC work include the following:

- Installation of a three-inch diameter submersible pump in well GW-032B. The horsepower of the pump will be selected on the basis of the pumping test results.

- Installation of a stilling tube in the well to allow for manual water level measurements using an electronic water level meter.

- Installation of a pitless adapter to the GW-032B well riser and trenching to allow for connection of electrical service and pump discharge piping from the new well to the existing GW-032A hotbox.

- Activation of the new pumping system and observation and monitoring of the initial few hours of GW-032B recovery well operation to verify pumping system components are operating properly and, as necessary, to adjust system settings.

Task 1.6 – Hot Box Improvements

At the time of the GW-032B pump system installation, GSC will also make improvements to the existing GW-032A hotbox. Specific improvements include repair/replacement of hot box insulation, additional weatherizing, replacement of the totalizing flow meter, possible replacement of level controls if necessary, replacement of the magnetic starter, and modification of the hotbox heating system.

Task 2 – Well GW-032A Decommissioning

PWI will remobilize to the Site to perform decommissioning of well GW-032A. In general, the well decommissioning will be performed in accordance with the procedures set forth in NYSDEC policy document *CP-43: Groundwater Monitoring Well Decommissioning Policy*, dated November 3, 2009. The well will be decommissioned by overdrilling of the GW-032A well bore using the following steps:

1. Remove pumping system, manhole and concrete roadbox completion (to be completed at the time of the Task 1.5 field activities).

2. Clean out the inside of the GW-032A well and sump using a tri-cone rollerbit.

3. Puncture the bottom of the well using drill rods and a drive point.

4. Fill the well with bentonite grout from the bottom up using a tremie pipe (Use of bentonite grout rather than the "Standard Grout Mixture" referenced in NYSDEC policy document CP-43 is recommended due to the proximity of well GW-032A to the new recovery well GW-032B).

5. Overdrill the well riser, screen and sump using 6 ¼-inch I.D. hollow-stem augers. The overdrilling will extend to a depth of 22 feet below ground surface, equivalent to the bottom of the well.

6. To the extent practicable, remove the well screen and riser from inside the hollow-stem augers.

7. Remove the hollow-stem augers while adding bentonite grout to the borehole if there is any settlement of the grout column (Use of bentonite grout rather than the "Standard Grout Mixture" referenced in NYSDEC policy document CP-43 is recommended due to the proximity of well GW-032A to the new recovery well GW-032B).

8. Cap the former well bore with topsoil.

The decommissioning will be observed and logged by GSC geologist. The drill rig and all downhole drilling equipment will be steam-cleaned prior to arrival on-Site and upon completion of well decommissioning. Steam cleaning will be performed using a temporary decontamination pad located adjacent to the well drilling location. Soils removed during the GW-032A decommissioning will be placed in DOT approved "ring-top" 55-gallon drums. In coordination with IBM, the drums will be labeled by GSC and transferred by PWI to IBM's on-Site containerized waste storage area in Building 309. The well decommissioning will be documented on the well decommissioning record form provided as Figure 3 of NYSDEC policy document CP-43. A transmittal letter and well decommissioning form will be transmitted to NYSDEC as documentation of the work completion.

SCHEDULE

IBM anticipates the scope of work described above would be completed within about seven months. The schedule assumes up to two months to complete Task 1.1 through Task 1.3 field explorations and testing; up to two months for Task 1.4 data analysis and report preparation; up to two months for NYSDEC report review; two to three weeks for completion of Task 1.5 and Task 1.6 field activities; and one week to complete well GW-032A decommissioning. Please note this schedule assumes no extended delays in completion of the work due to weather, contractor scheduling, or other factors that are outside of IBM's control. Throughout the performance of the work, GSC will attempt to coordinate the various work tasks in such a manner as to avoid extended delays in contractor scheduling and will make adjustments in staffing if necessary to expedite completion of the work.

PROJECT MANAGEMENT

IBM's project manager for the GW-032A replacement and decommissioning work will be Ms. Jacqueline Braungart of IBM's East Fishkill Facility. Ms. Braungart will be assisted by David Speed and Steven Hawkins, both of IBM.

Groundwater Sciences Corporation will perform the GW-032A replacement activities. GSC's project team will include Robert C. Watson, P.G., who will serve as Project Director. He will be assisted by C. Edward Stoner, P.G., GSC's Project Manager; Dorothy A. Bergmann, P.G., GSC's Quality Assurance Project Manager; and Mitchell W. Ruchin, GSC's Field Operations Manager.

The drilling contractor will be Parratt-Wolff, Inc. of East Syracuse, New York. Location and elevation services will be performed by Spectra Engineering, Architecture, and Surveying, P.C. of Poughkeepsie, New York. Analytical laboratory analyses will be performed by Columbia Analytical Services of Rochester, New York.

Should you have any questions concerning this Work Plan for replacement of Remediation Area D recovery well GW-032A, please contact Jackie Braungart of IBM at (845) 892-1672.

Very truly yours,
GROUNDWATER SCIENCES CORPORATION

C. Edward Stoner, P.G.
Project Manager

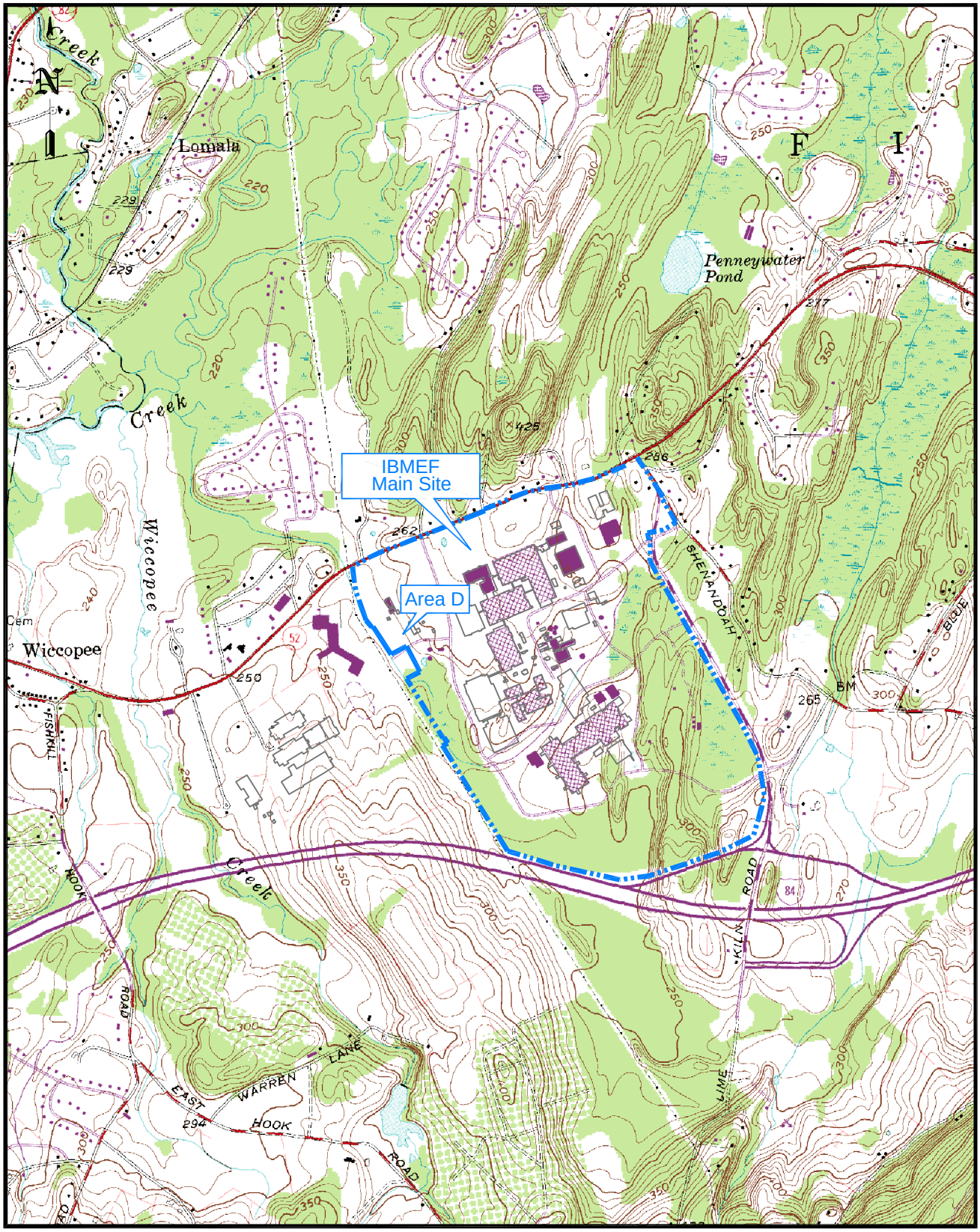
Robert C. Watson

Robert C. Watson, P.G.
Vice President

RCW/CES

Attachments:

Figure 1 – Site Location Map
Figure 2 – Remediation Area D Location Map
Appendix A – Boring and Well Installation Logs
Appendix B – Field Forms



Portion of the Hopewell Junction, NY
7.5-minute USGS Quadrangle
(1957, Photorevised 1981)

Figure 1

IBM
East Fishkill, New York

Site Location Map

Scale
0 1000' 2000'

GROUNDWATER SCIENCES CORPORATION

95007-044-A3 / 09-28-10

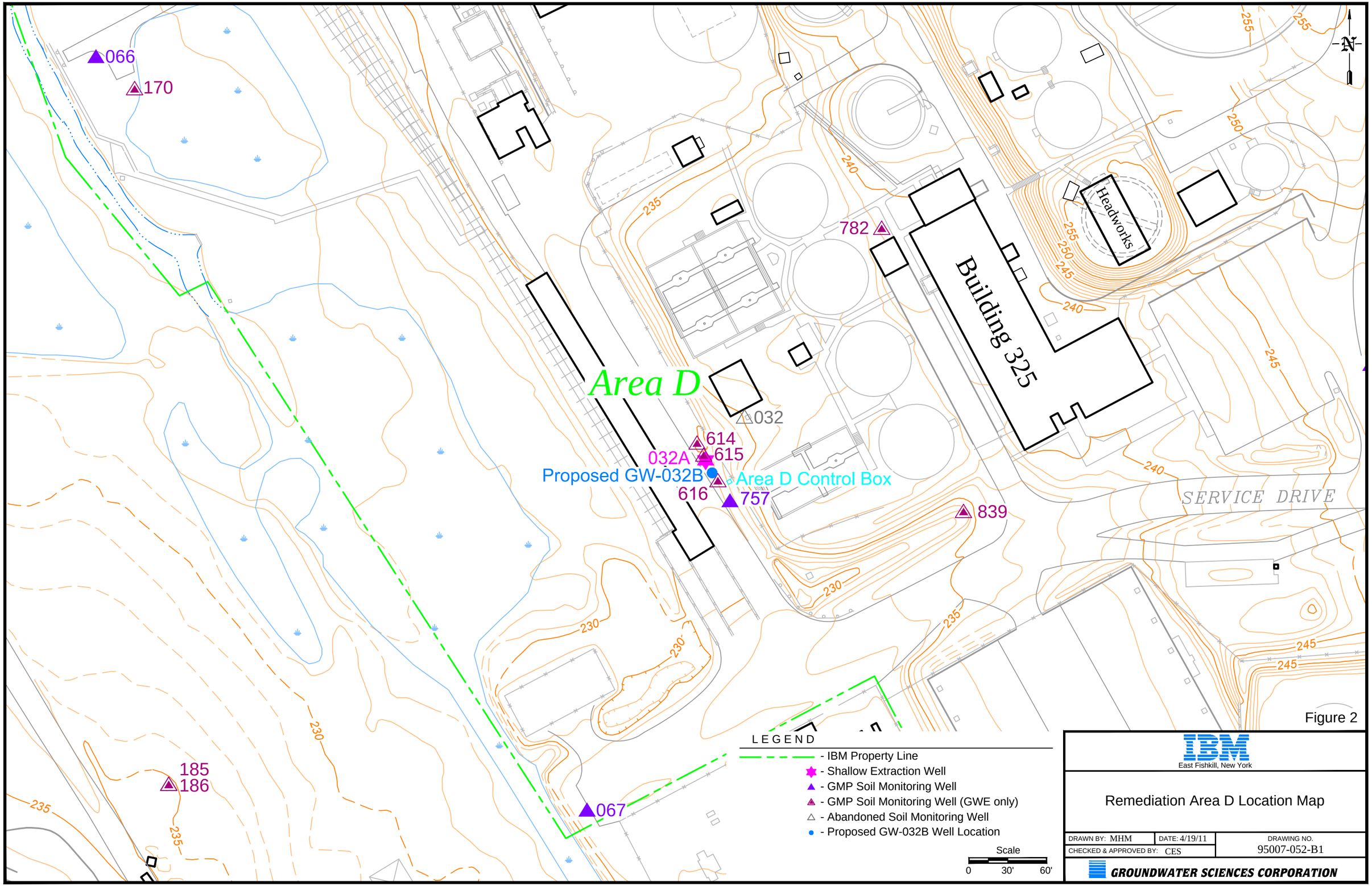


Figure 2

IBM
East Fishkill, New York

Remediation Area D Location Map

DRAWN BY: MHM	DATE: 4/19/11	DRAWING NO. 95007-052-B1
CHECKED & APPROVED BY: CES		

GROUNDWATER SCIENCES CORPORATION

Sanborn, Head & Associates, Inc.

Log of Monitoring Well 32A

PROJECT NO.: *1486.2*

PROJECT: *Well GW-032 Replacement*

DATE STARTED: *1/14/98* DATE FINISHED: *1/14/98*

LOCATION: *Area D IBM East Fishkill, New York*

SURFACE ELEVATION: *231.0 feet AMSL*

DRILLING METHOD: *6 1/4" ID HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
1/15/98	0700	3.73' bgs	Out	15.5 hrs.
1/15/98	0700	3.73' bgs	Out	15.5 hrs.
1/15/98	1030	3.83' bgs	Out	19 hrs.
1/16/98	0655	3.62' bgs	Out	~40 hrs.

DRILLING COMPANY: *North Star Drilling, Inc.*

FOREMAN: *Jeff Thew*

LOGGED BY: *RCW* CHECKED BY: *DBC*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION
0							SOIL FILL
5							F/M SAND
10							F/C SAND & GRAVEL
15							M/C SAND & GRAVEL
20							SILT & CLAY
25							
30							
35							

GEOLOGIC DESCRIPTION

No samples were obtained. For soil descriptions from 0 to 6 feet, refer to test pit log TP-2.

For soil descriptions from 6 to 18 feet, refer to boring log PZ-2.

Bottom of Boring at 22'.

Notes:

1. Prior to drilling a test pit was excavated to a depth of 6 feet to confirm the absence of subsurface utilities.

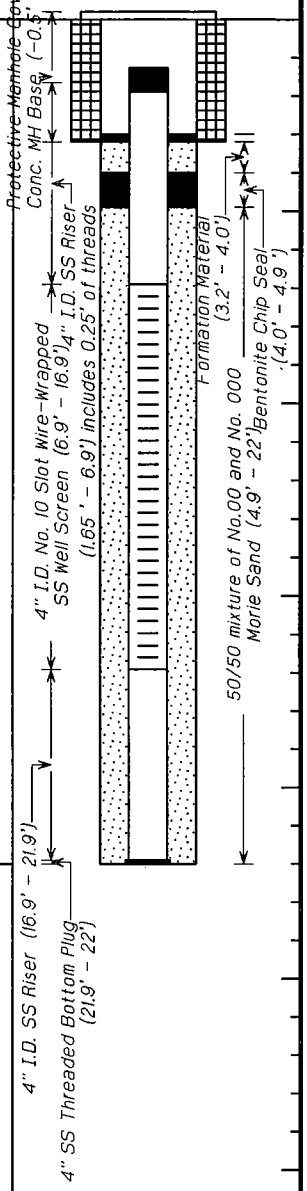
2. The boring was conducted about 3.1 feet south of piezometer PZ-2.

3. The driller indicated a "gravelly zone" with cobbles was encountered while advancing the borehole from about 12 to 16 feet. Rounded cobbles were observed in auger cuttings while advancing the borehole from about 18 to 22 feet.

4. The borehole was terminated at a depth of 22 feet without encountering refusal.

5. Upon completion of the boring, an extraction well was installed consisting of 4-inch I.D. No. 10 slot wire-wrapped stainless steel well screen and 4-inch I.D. stainless steel riser.

WELL DIAGRAM



Sanborn, Head & Associates, Inc.

Log of Monitoring Well 614

PROJECT NO.: *1486.2*

PROJECT: *Well GW-032 Replacement*

DATE STARTED: *1/13/98* DATE FINISHED: *1/13/98*

LOCATION: *Area D IBM East Fishkill, New York*

SURFACE ELEVATION: *231.0 feet AMSL*

DRILLING METHOD: *4 1/4" ID HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
1/14/98	0710	3.47' bgs	Out	15.5 hrs.
1/15/98	0700	3.40' bgs	Out	~ 40 hrs.
1/16/98	0655	3.12' bgs	Out	~2.7 days
1/19/98	1745	3.34' bgs	Out	~6 days

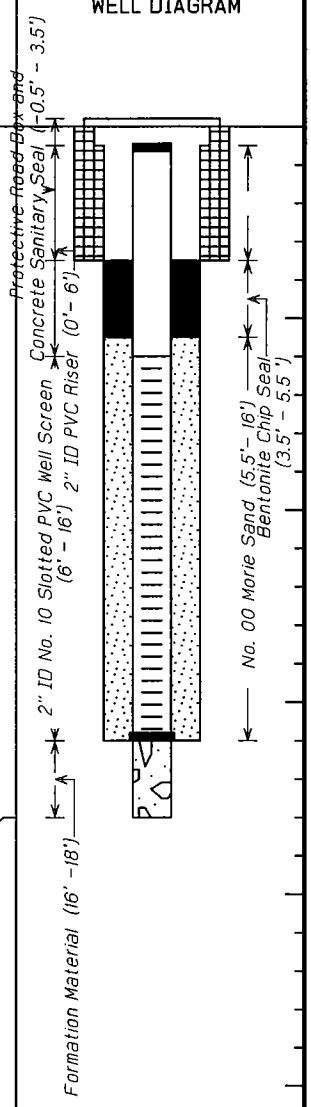
DRILLING COMPANY: *North Star Drilling, Inc.*

FOREMAN: *Jeff Thew*

LOGGED BY: *RCW* CHECKED BY: *DBC*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION	GEOLOGIC DESCRIPTION
5							SOIL FILL	No samples were obtained from the ground suface to a depth of about 6 feet. For soil descriptions from 0 to 6 feet. Refer to test pit log TP-2.
							F/M SAND	
	S-1 6-8'	3-5 10-10	24/15	1.4			F/C SAND & GRAVEL	S-1: Medium dense, olive-brown, GRAVEL, some fine to coarse SAND, little Silt, trace Clay. Wet.
	S-2 8-10'	15-17 14-15	24/11	1.3				S-2: Dense, olive-brown to brown, fine to coarse SAND, some Gravel, little Silt, trace Clay. Wet. Mottled.
10	S-3 10-12'	5-10 12-6	24/6	0.9			GRAVEL	S-3: Medium dense, brown, GRAVEL, little fine to coarse Sand, trace Clayey Silt. Wet. Mottled.
	S-4 12-14'	9-10 12-15	24/9	1.7			M/C SAND & GRAVEL	S-4: Medium dense, brown, medium to coarse SAND, some Gravel, little Clayey Silt. Wet.
	S-5 14-16	6-9 9-7	24/7	1.4			M/C SAND	S-5: Medium dense, brown, medium to coarse SAND, little Gravel, little Clayey Silt. Wet.
15	S-6/6A 16-18'	7-10 10-12	24/10	2.6 1.2			SILT & CLAY	S-6: Very stiff, olive-brown, SILT & CLAY, trace fine Sand. Wet.
								Change at approximately 16.2 feet to gray CLAY & SILT, trace fine Sand. Wet.
								Bottom of Boring at 18'.
20								**Notes:**
								1. Prior to drilling a test pit was excavated to a depth of 6 feet to confirm the absence of subsurface utilities.
								2. The headspace of soil samples was screened for volatile organic compounds (VOCs) using a Photovac Model MP-1000 Microtip Photoionization Detector (PID) with a 10.6 eV lamp calibrated to a 100 ppm isobutylene standard. Background PID readings in ambient air typically were 0.6 to 3.0 ppmv during drilling.
25								3. The driller indicated a "gravelly zone" was encountered while advancing the borehole from about 12 to 14 feet.
								4. The borehole was terminated at a depth of 18 feet without encountering refusal.
30								5. Upon completion of the boring, a piezometer was installed consisting of 2-inch I.D. No. 10 slot PVC well screen and 2-inch I.D. Schedule 40 PVC Riser. A 0.51 foot extension was added to the PVC Riser during installation of the protective roadbox and concrete sanitary seal.
35								

WELL DIAGRAM



Sanborn, Head & Associates, Inc.

Log of Monitoring Well 615

PROJECT NO.: *1486.2*

PROJECT: *Well GW-032 Replacement*

DATE STARTED: *1/13/98* DATE FINISHED: *1/13/98*

LOCATION: *Area D IBM East Fishkill, New York*

SURFACE ELEVATION: *231.0 feet AMSL*

DRILLING METHOD: *4 1/4" ID HSA*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
1/13/98	1233	2.16' bgs	Out	40 mins.
1/13/98	1253	2.45' bgs	Out	~ 1 hr.
1/14/98	0710	3.92' bgs	Out	~18.3 hrs.
1/19/98	1743	3.28' bgs	Out	~6 days

DRILLING COMPANY: *North Star Drilling, Inc.*

FOREMAN: *Jeff Thew*

LOGGED BY: *JCC/RCW* CHECKED BY: *DBC*

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION
5	S-1 6-8'	3-7 8-9	24/2	3.0			SOIL FILL
							F/M SAND
	S-2 8-10'	9-10 11-11	24/16	1.6			F/C SAND & GRAVEL
10	S-3 10-12'	14-15 12-14	24/9	1.4			
	S-4 12-14'	15-14 8-10	24/14	0.7			M/C SAND & GRAVEL
15	S-5 14-16	15-14 14-12	24/12	1.4			
	S-6 16-18'	10-9 9-12	24/16	0.9 0.6			SILT & CLAY
20							
25							
30							
35							

GEOLOGIC DESCRIPTION

No samples were obtained from the ground suface to a depth of about 6 feet. For soil descriptions from 0 to 6 feet. Refer to test pit log TP-2.

S-1: Medium dense, olive-brown, GRAVEL, little fine to coarse Sand, trace Clayey Silt. Wet. (Poor recovery due to large piece of angular gravel in bottom of split spoon).

S-2: Medium dense, olive-brown, fine to coarse SAND and Gravel, little Clayey Silt. Wet.

S-3: Medium dense, olive-brown, GRAVEL, some coarse Sand, little Clayey Silt. Wet.

S-4: Medium dense, olive-brown, GRAVEL, and medium to coarse Sand, little Clayey Silt. Wet.

S-5: Medium dense, olive-brown, GRAVEL, some medium to coarse Sand, trace Clayey Silt. Wet. (Gravel is subangular to subrounded and appears to be pieces of rounded cobbles).

S-6: Very stiff, olive-gray to gray, SILT & CLAY, trace Gravel, trace fine Sand. Moist to wet. (Clay content increasing with depth).

Bottom of Boring at 18'.

Notes:

1. Prior to drilling a test pit was excavated to a depth of 6 feet to confirm the absence of subsurface utilities.

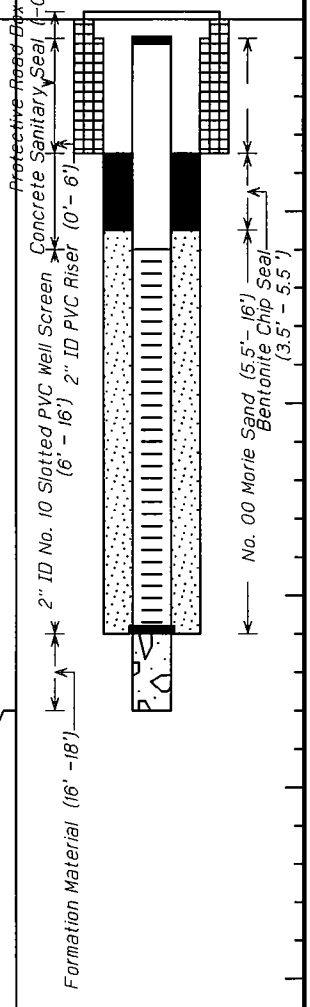
2. The headspace of soil samples was screened for volatile organic compounds (VOCs) using a Photovac Model MP-1000 Microtip Photoionization Detector (PID) with a 10.6 eV lamp calibrated to a 100 ppm isobutylene standard. Background PID readings in ambient air typically were 0.6 to 3.0 ppmv during drilling.

3. The driller indicated a "gravelly zone" with cobbles was encountered while advancing the borehole from about 12 to 16 feet.

4. The borehole was terminated at a depth of 18 feet without encountering refusal.

5. Upon completion of the boring, a piezometer was installed consisting of 2-inch I.D. No. 10 slot PVC well screen and 2-inch I.D. Schedule 40 PVC Riser.

WELL DIAGRAM



Sanborn, Head & Associates, Inc.

Log of Monitoring Well 616

PROJECT NO.: *1486.2*

PROJECT: *Well GW-032 Replacement*

DATE STARTED: *1/14/98* DATE FINISHED: *1/14/98*

LOCATION: *Area D IBM East Fishkill, New York*

SURFACE ELEVATION: *231.3 feet AMSL*

DRILLING METHOD: *4 1/4" ID HSA*

DRILLING COMPANY: *North Star Drilling, Inc.*

FOREMAN: *Jeff Thew*

LOGGED BY: *RCW* CHECKED BY: *DBC*

GROUNDWATER READINGS

DATE	TIME	DEPTH	CASING	STAB. TIME
1/14/98	1125	4.35' bgs	Out	25 mins.
1/14/98	1604	4.21' bgs	Out	~ 5 hrs.
1/15/98	0700	4.16' bgs	Out	~20 hrs.
1/19/98	1712	3.74' bgs	Out	~4 days

DEPTH feet	SAMPLE NO. Depth (ft.)	BLOWS/6"	PEN/REC (in.)	PID (ppm) VALUES	PID (ppm) PROFILE 0 200	GRAPHIC LOG	STRATUM DESCRIPTION
5	S-1 6-8'	5-8 14-10	24/7	0.1			SOIL FILL
							M/C SAND & GRAVEL
	S-2 8-10'	8-6 6-8	24/5	0.0			F/C SAND
10	S-3 10-12'	5-6 10-12	24/6	0.4			F/C SAND & GRAVEL
	S-4 12-14'	6-7 10-8	24/9	0.1			M/C SAND & GRAVEL
15	S-5/5A 14-16	6-6 7-12	24/14	0.4 0.2			S & GRVL
							SILT & CLAY
20							
25							
30							
35							

GEOLOGIC DESCRIPTION

No samples were obtained from the ground suface to a depth of about 6 feet. For soil descriptions from 0 to 6 feet. Refer to test pit log TP-1.

S-1: Medium dense, olive-gray to olive-brown, fine to coarse SAND, little Gravel, trace Clayey Silt. Wet. Mottled.

S-2: Medium dense, olive-brown, GRAVEL, some fine to coarse SAND, trace Clayey Silt. Wet.

S-3: Medium dense, olive-brown, fine to coarse SAND and Gravel, little Clayey Silt. Wet.

S-4: Medium dense, olive-brown, medium to coarse SAND, some Gravel, trace Clayey Silt. Wet. Coarse Sand is subangular.

S-5: Medium dense, olive-brown, Clayey SILT, some Gravel, trace fine to coarse Sand.

Change at approximately 15 feet to gray, SILT & CLAY, trace coarse Sand, trace Gravel. Wet.

Bottom of Boring at 16'.

Notes:

1. Prior to drilling a test pit was excavated to a depth of 7 to 8 feet to confirm the absence of subsurface utilities.

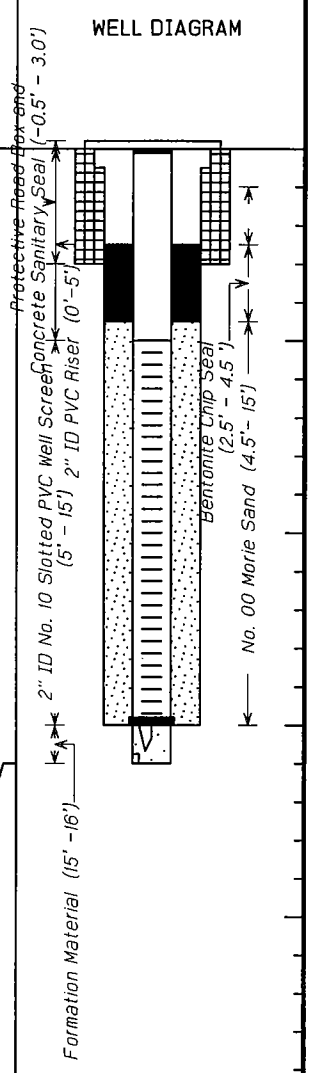
2. The headspace of soil samples was screened for volatile organic compounds (VOCs) using a Photovac Model MP-1000 Microtip Photoionization Detector (PID) with a 10.6 eV lamp calibrated to a 100 ppm isobutylene standard. Background PID readings in ambient air typically were 0.0 to 0.4 ppmv during drilling.

3. The driller indicated a "gravelly zone" was encountered while advancing the borehole from about 12 to 14 feet.

4. The borehole was terminated at a depth of 16 feet without encountering refusal.

5. Upon completion of the boring, a piezometer well was installed consisting of 2-inch I.D. No. 10 slot PVC well screen and 2-inch I.D. Schedule 40 PVC Riser.

WELL DIAGRAM



IBM-EF-

Phone
(203) - 888-4531

MONITOR WELL INSTALLATION DETAIL

SOILTESTING, INC.

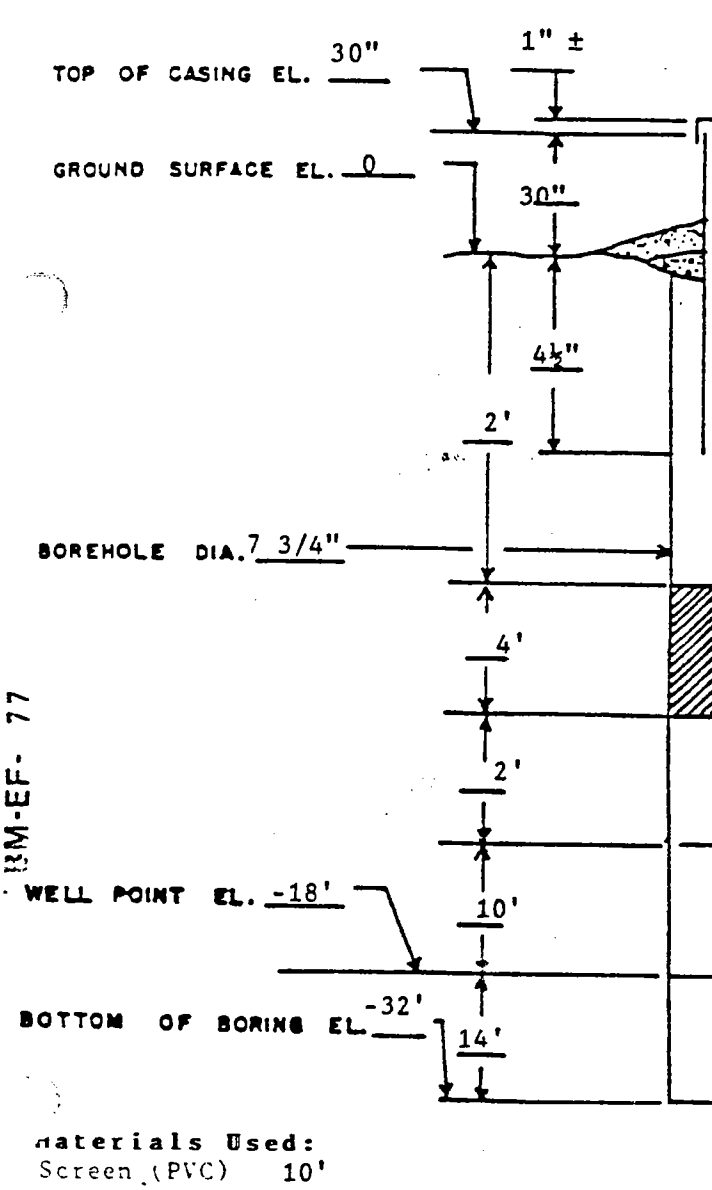
140 OXFORD ROAD - OXFORD, CONN. 06483

SUBSURFACE INVESTIGATIONS - ENVIRONMENTAL/GEOTECHNICAL SITE ASSESSMENTS - Test Borings
Core Drilling - Monitoring Wells - Resistivity Tests

MONITOR WELL # Adj Well 32

Client: Whiting Turner/Chazen
Job #: E24-1947-87 (@IBM)

#757



VENTED LOCKING STEEL CAP: x YES ___ NO

PROTECTIVE STEEL CASING: x YES ___ NO

MOUNDED BACKFILL: x YES ___ NO

CONCRETE COLLAR: ___ YES x NO

BACKFILL MATERIAL: drill cuttings

TYPE OF CASING & SCREEN: 2" SCH 40 PVC

I.D. 2.067" O.D. 2.375"

JOINT TYPE: threaded flush joint

IMPERMEABLE BACKFILL: Bentonite

BACKFILL MATERIAL: #1 Silica Sand & drill cuttings

SCREEN PACKING: #1 Silica Sand & drill cuttings

FILTER FABRIC: ___ YES x NO

IF YES, TYPE: ___

SCREEN SLOT SIZE: #20

BACKFILL MATERIAL: bentonite slurry/ coarse grade bentonite

REFUSAL: ___ YES x NO

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Materials Used:

Screen (PVC)	10'
Riser (PVC)	10'
Plug (PVC)	1
Filter Fabric	n/a
Silica Sand	3 bags
Powdered Bentonite	1 bag
Bentonite Pellets	
Granular C/G Bentonite	6 bags
Protective Casing w/cap	7'

IBM-EF-

SOILTESTING, INC.
140 OXFORD ROAD
OXFORD, CONN. 06483

CLIENT: Whiting Turner

SHEET 1 OF 1
HOLE NO: adj well #32

PROJECT NO: E24-1947-87

BORING LOCATIONS: per instructions

PROJECT NAME: IBM

#757
OFFSET

FOREMAN - DRILLER: MC km bm jad

LOCATION: East Fishkill Facility, NY

INSPECTOR: G Spiciarich (MC)

GROUND WATER OBSERVATIONS
AT 6 ± FT AFTER 0 HOURS
AT ____ FT AFTER ____ HOURS

	CASING	SAMPLER	CORE BAR
TYPE	HSA	SS	
SIZE I.D	3 3/4"	1 3/8"	
HAMMER WT		140#	BIT
HAMMER FALL		30"	

Date Start 9-25 Date Fin. 9-25-87
SURFACE ELEV
GROUND WATER ELEV

DEPTH	CASING BLOWS PER FOOT	SAMPLE NO	TYPE	PEN	REC	DEPTH @ BOT	BLOWS PER 6 ON SAMPLER (FORCE ON TUBE) 0-6	6-12	12-18	CORING TIME PER FT (MIN)	DENSITY OR CONSIST MOIST	STRATA CHANGE DEPTH ELEV	FIELD IDENTIFICATION OF SOIL REMARKS INCL COLOR, LOSS OF WASH WATER, BEAMS IN ROCK, ETC
													brn SILT, lit cF gravel, tr f-sand
											dense		
		1	SS	17"	5"	6'5"	9	25	50/5"		wet	5'	
5													brn SILT, lit f-sand, tr cF gravel
		2	SS	24"	12"	9'	9	8			med		
							8	10			wet	10'	
		3	SS	24"	12"	11'	5	6				10'6"	grey F SAND
10							6	6					grey CM SAND, lit silt, cF gravel
		4	SS	12"	12"	12'	4	4					
		5	SS	24"	16"	14'	8	12					grey CMf SAND, some cF gravel, tr silt
							15	15					
		6	SS	24"	3"	16'	9	10					
							11	16					
		7	SS	24"	10"	18'	6	8			moist	17'	
							10	13			med		grey SILTY CLAY
		8	SS	24"	12"	20'	5	8					
							7	12					
		9	SS	24"	18"	22'	8	8					
							11	10					
		10	SS	24"	24"	24'	9	9					
							10	8					
		11	SS	24"	24"	26'	6	29			dense	25'6"	
							12	13					dk grey Cf GRAVEL, lit cm sand, clay
		12	SS	24"	24"	28'	44	43			dense	27'	
							29	28			moist/wet		grey FM SAND, lit silt, tr cF gravel, lit cobbles, boulders
		13	SS	24"	24"	30'	24	25					
							25	20			moist		
		14	SS	24"	24"	32'	19	19				31'	
							20	19					grey MF SAND, lit cF gravel, tr silt
												32'	
													End of Boring 32'

HOLE NO Adj. Well #32

RFACE TO ____ FT. USED ____ CASING THEN ____ CASING TO ____ FT

W: WASHED P: PIT A: AUGER UP: UNDISTURBED PISTON C = COARSE

UB UNDISTURBED BALL CHECK T: THINWALL V: VANE TEST M = MEDIUM

DE OPEN END SAMPLER SS SPLIT TUBE SAMPLER H.S.A. - HOLLOW STEM AUGER F = FINE

PROPORTIONS USED: TRACE 0-10%, LITTLE 10-20%, SOME = 20-35%, AND = 35-50%.

FIELD OPERATIONS REPORT

Project No. _____

Total Depth _____
Depth to S.S. Refusal _____
Depth to Competent Bedrock _____
SWL (Date) _____
Screened Interval _____
Hole Diameter _____
Monitoring Tube _____
Elev., Ground Surface _____

Well No. _____
Driller _____
Logged by _____
Drilling Began _____
Drilling Completed _____
Well Const. Completed _____
Development Completed _____
Elev., T.O.C. _____

Depth	Blow Count	PID (ppm)	Recovery in.	Sample No./ Run No.	SAMPLE DESCRIPTION (USCS), Grn. Size, Color, Shape, texture, moistness, etc.	% Grn. Size C	S	Sd	Gr	Other Notes	Graphic Lith.	Well Constr.	Depth

Well Development Field Data Sheet

Well ____________________ Site ____________________

Well Deveopment Personnel ____________ Pump Type ____________________

Casing Diameter (in) ____________ DTW ____________ DTB ____________

Well Volume = ____________ gal/ft* x (DTB-DTW) = ____________

x 3 = ____________

x 10 = ____________

Date	Time	WL (ft)	Flow Rate	Temp.	Temp. Change (units)	pH	ph Change (units)	Cond.	Cond. Change (%)	Turb.	Turb. Change (units)	Total Volume	Remarks

* gal/ft: 1.5" = 0.092; 2" = 0.163; 4" = 0.65; 6" = 1.45; 8" = 2.61

AQUIFER TEST DATA

Owner ______________________________ Address __________________________________ County ________________ State _________

Date ____________________ Company performing test ______________________________________ Measured by ______________________

Well No. __________________ Distance from pumping well _________ Type of test __________________________________ Test No. ________

Measuring equipment ____

Time Data	Water Level Data	Discharge Data	
Pump on: Date _____ Time _____ (t) Pump off: Date _____ Time _____ (r) Duration of aquifer test: Pumping _______ Recovery _____	Static water level ____________ Measuring point ____________ Elevation of measuring point _______	How Q measured ____________ Depth of pump/air line __________ Previous Pumping? Yes ____ No ____ Duration ___________ End ______	Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measure-ment	Correction or Conversion	Water Level	Water level change s or s'		Discharge measure-ment	Rate		

Columbia Analytical Services, INC
An Employee-Owned Company
www.caslab.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

One Mustard St., Suite 250 • Rochester, NY 14609-0859 • (716) 288-5380 • 800-695-7222 x11 • FAX (716) 288-8475 PAGE _____ OF _____

SR #

CAS Contact

Project Name	Project Number
Project Manager	Report CC
Company/Address	
Phone #	FAX#
Sampler's Signature	Sampler's Printed Name

ANALYSIS REQUESTED *(Include Method Number and Container Preservative)*

PRESERVATIVE

NUMBER OF CONTAINERS

GC/MS VOA's ☐ 8260 ☐ 624 ☐ CLP
GC/MS SVOA's ☐ 8270 ☐ 625 ☐ CLP
GC VOA's ☐ 8021 ☐ 601/602
PESTICIDES/ PCB's ☐ 8081 ☐ 608 ☐ CLP ☐ 8082
STAR'S LIST 8021 VOA's ☐ TOTAL ☐ TCLP
STAR'S LIST 8270 SVOA's ☐ TOTAL ☐ TCLP
TCLP ☐ METALS ☐ VOA's ☐ SVOA's ☐ H/P
WASTE CHARACTERIZATION ☐ React ☐ Corros. ☐ Ignit.
METALS, TOTAL (List in comments below)
METALS, DISSOLVED (List in comments below)

Preservative Key
0. NONE
1. HCL
2. HNO_3
3. H_2SO_4
4. NaOH
5. Zn. Acetate
6. MeOH
7. $NaHSO_4$
8. Other _____

REMARKS/ ALTERNATE DESCRIPTION

CLIENT SAMPLE ID	FOR OFFICE USE ONLY LAB ID	SAMPLING DATE	SAMPLING TIME	MATRIX

SPECIAL INSTRUCTIONS/COMMENTS
Metals

See QAPP ☐

TURNAROUND REQUIREMENTS
_____ **RUSH** (SURCHARGES APPLY)
_____ **24 hr*** _____ **48 hr** _____ **5 day**
_____ **STANDARD**
REQUESTED FAX DATE
_____
REQUESTED REPORT DATE
_____

REPORT REQUIREMENTS
_____ I. Results Only
_____ II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
_____ III. Results + QC and Calibration Summaries
_____ IV. Data Validation Report with Raw Data
_____ V. Speicalized Forms / Custom Report
Edata _____ Yes _____ No

INVOICE INFORMATION
PO#
BILL TO:
SUBMISSION #:

SAMPLE RECEIPT: CONDITION/COOLER TEMP: _____ CUSTODY SEALS: Y N

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY
Signature	Signature	Signature	Signature	Signature	Signature
Printed Name	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm	Firm	Firm	Firm	Firm	Firm
Date/Time	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

Distribution: White - Return to Originator; Yellow - Lab Copy; Pink - Retained by Client

SCOC-0402-40

Chain of Custody Form