DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: **IBM East Fishkill Facility**
Facility Address: **2070 Route 52, Hopewell Junction, NY 12533**
Facility EPA ID #: **NYD000707901**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__X__ If yes - check here and continue with #2 below.

_____ If no - re-evaluate existing data, or

_____ if data are not available, skip to #8 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

X If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

___ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

___ If unknown - skip to #8 and enter "IN" status code.

Rationale.

Facility And Release Sources.

The 600 acre IBM East Fishkill Facility, as shown on Plate 1, is located approximately 50 miles north of New York City and 10 miles east of the Hudson River. The Facility is bordered by Lime Kiln Road to the east, State Route 52 to the north, U.S. Route 84 to the south and open fields surrounding a creek to the west. The facility is divided into the East and West Complexes which are separated by Gildersleeve Brook, John Jay High School and an electric transmission line. The 430-acre East Complex has been used since 1963 for manufacturing of semiconductor and electronic computing equipment and has about 30 buildings and structures. At this Complex the groundwater is contaminated and subject to an extensive monitoring and remediation program. The 162-acre West Complex housed IBM's semiconductor research and development activities. Groundwater at this Complex is not contaminated but IBM does maintain a groundwater detection monitoring program. That program assesses the groundwater quality at the West Complex and the effectiveness of the remediation system operating at the East Complex to control contaminant migration. The IBM East Fishkill Facility's groundwater monitoring program at both Complexes provides the necessary data to manage the water quality problems and the Facility's water supply. Deep bedrock groundwater is pumped from 14 active production wells, six of which are located on the East Complex and the remainder located off-site. Groundwater from the production wells serve as the primary source of water for the Facility. Contaminated groundwater pumped from the East Complex is subject to treatment prior to its use for production and on-site drinking water.

At the East Complex IBM completed several remedial investigations where elevated levels of contaminants were detected both in the soil and groundwater. Several major sources of releases were identified and remediated including: (1) the former underground solvent tank systems; (2) the former underground piping systems that transported wastewater with high concentrations of contaminants and spent solvents for recycling between buildings; (3) several open burning fire-training areas where spent solvents were disposed; (4) a hazardous waste landfill; and (5) a solid waste land-based storage area. However, the presence of dense non-aqueous phase liquid (DNAPL) in the deep bedrock from prior solvent releases remains a constant source of bedrock groundwater contamination in the East Complex.

Geology And Groundwater Hydrogeology.

Groundwater at the IBM East Fishkill Facility occurs in saturated zones within the subsurface soil (i.e., overburden) and bedrock. In general, recharge to the bedrock passes through or around the overlying soil units, which include fill, alluvial sands and gravels, and extensive but discontinuous layer of glaciolacustrine silt and clay, and an extensive glacial till. The maximum thickness of these units is 120 feet. Strong vertical flow of groundwater is induced by the six on-site corrective action pumping wells completed in the bedrock.

On the East Complex, seven shallow soil groundwater areas and the deep bedrock groundwater are contaminated with organic contaminants with the latter containing DNAPL. The seven soil groundwater areas of concern (AOCs) depicted in Plate 1 are as follows; Area A, Area B, Area D, Landfill Area, Southeast Quadrant (SEQ), Building 322 (B/322) Area and Building 330 (B/330) Area. Plate 2 shows the groundwater elevations for portions of the soil water table and large unsaturated areas during the third quarter of 2000 (July) under dynamic conditions of long-

term corrective action pumping in the bedrock. The unsaturated soils are generally found in areas that have been dewatered by pumping or that lie on top of buried bedrock ridges or other areas of relatively high bedrock surface elevation. In the northern parts of the East Complex the water table mirrors the surface topography of the silt/clay unit together with several areas of dense till which act as the primary control on soil groundwater flow. These geologic units inhibit vertical flow of soil groundwater into lower units and act as a barrier to vertical contaminant transport. Geologic areas where the subsurface units are not dense allow the soil groundwater to pass into the bedrock. Significant areas of soil groundwater are the zones of perched water that exist in fine-to course-grained alluvial sand that lies above the silt/clay unit in Area A, Area D and B/322 AOCs. Groundwater flow within the alluvial sand and above the silt/clay unit has been calculated to range from 0.03 to 70 feet per day with a median of 0.7 feet/day.

Plate 3 depicts the potentionmetric head distribution in the deep bedrock groundwater system during the third quarter of 2000 (July) under dynamic pumping conditions. This contour map was developed form the deepest bedrock well cluster with screened or open hole interval elevation between 50 and 120 feet amsl correlating with the principal water-bearing zones in the six production wells. The hydraulic characteristics of the fractured bedrock groundwater system are influenced by the bedrock's structural fabric, which generally tends north-south and was created by complex folding, fracturing and faulting. The groundwater flow arrows on Plate 3 represent only generalized flow directions and not the actual flow paths of groundwater "particles." This representation is typical for fractured bedrock aquifers where zones of high fracture connectivity facilitate flow in directions other than those determined by the apparent potentionmetric head distribution. Generally, groundwater flow directions are toward the production wells where steep vertical gradients occur.

Groundwater Contamination.

Groundwater monitoring data collected under an Order on Consent and for the 6NYCRR Part 373 RCRA Permit indicate that Part 703 New York State Groundwater Quality Standards (NYSGQS)and site-specific concentration limits (Table III-9, 6NYCRR Part 373 permit) have been exceeded both in the overburden and bedrock groundwater. At the East Complex there are at least nine separate contaminant groundwater plumes in the overburden and at least four contaminant plumes in the bedrock. The key organic contaminants and their respective NYSGQS are as follows:

Contaminant	NYSGQS-ug/l
cis-1,2-Dichloroethene (CIS)	5.0
1,1,2-Trichloro-1,2,2- Trifluorethane (Freon TF)	5.0
Tetrachloroethene (PCE)	5.0
Trichloroethene (TCE)	5.0
Vinyl Chloride (VC)	2.0

PCE, TCE, CIS and VC are discussed as a group and collectively referred to as the PCE-series compounds. The concentration for this group is calculated by normalizing the groundwater concentrations of the transformation products of PCE so as to account for the degradation of PCE by dehalogenation, which occurs at different rates and by different processes across the site. Isoconcentration contour maps based on third quarter 2000 (July) data are shown on Plates 4, 5, 6 and 7 with the approximate limit of each contaminant plume defined by the annual median concentration equal to 5.0 ug/l of one key compound (Freon TF) or the sum of key compounds (normalized PCE-series compounds). In general contaminant movement is controlled primarily by the direction of groundwater flow in the soil and bedrock. East Complex groundwater at levels exceeding the NYSGQS is hydraulically contained to the site by corrective action pumping of the on-site bedrock production wells

References.

IBM East Fishkill Order on Consent, Case #3-0556; Article 27 ECL, New York State Department of Environmental Conservation, April 27, 1981.

IBM East Fishkill Order on Consent Supplement and Clarification, Case #3-0556; Article 27, ECL, New York State Department of Environmental Conservation, June 19, 1986.

6NYCRR Part 373 Permit, IBM East Fishkill facility, New York State Department of Environmental Conservation, September 29, 1995.

1995 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, July 26, 1996.
1996 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 29, 1997.
1997 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 22, 1998.
1998 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 26, 1999.
1999 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 30, 2000.
2000 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 30, 2001.
Groundwater RFI Final Report, B/322 Area of Concern, Sanborn Head and Associates, April 11, 1997.
Groundwater RFI Final Report, B/330 Area of Concern, Sanborn Head Engineering, P.C., August 1997.

Footnotes:
[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale.

Groundwater Corrective Measures Implemented.

Extensive groundwater monitoring data collected at the East Fishkill Facility since 1979 indicates that migration of contaminated groundwater above NYS Groundwater Quality Standards in the overburden and deep bedrock aquifers is contained within the perimeter of the East Complex by several interim corrective measures (ICMs). Hydraulic control and capture of contaminated groundwater in the bedrock is accomplished by the continuous operation of six on-site production wells collectively pumping 1.2 million gallons per day on average. These production wells also induce strong vertical flow of groundwater in the overlying soil and shallow bedrock water bearing zones. This induced vertical flow allows the production wells to capture and control the migration of the soil/shallow bedrock contaminant plumes and to dewater overburden saturated soils leaving large portions of the site unsaturated.

In the northern area of the East Complex, where Area A, Area D and B/322 AOCs are located, the contaminated perched soil groundwater in the alluvial unit is captured by three separate shallow groundwater ICM pumping systems. In addition, where the silt and dense till below the alluvial unit are absent, primarily adjacent to Area A, shallow overburden groundwater flows into the deep bedrock where it is then captured by the bedrock production wells. At Area A high concentrations of PCE-series compounds were detected in two soil groundwater plumes during 2000 monitoring; 1,000 ug/l in the till plume and 10,000 ug/l in the alluvial sand and gravel plume. Contaminant control and reduction is achieved by pumping the soil groundwater and treating it in the Area A ICM.

This ICM achieves 99.9% contaminant removal efficiency by air stripping the PCE-series compounds from the groundwater before it's discharged under permit to Glidersleeve Brook. The small soil groundwater plume in the alluvial unit at Area D, containing less than 10 ug/l PCE during 2000 monitoring, and the larger alluvial and gravel soil groundwater plume at Area B/322, containing PCE concentrations up to 1,000 ug/l during 2000 monitoring, are both captured by pumping the perched soil groundwater from separate ICM extraction wells. The recovered contaminated water is then transported to the on-site IBM Industrial Water Pollution Control Facility (IWPCF) with subsequent discharge under permit to the same Brook. Pumping at the B/322 ICM was started-up in January 2000.

Area B, which is located south of Area A and at the eastern portion of the East Complex, contains low levels of PCE-series compounds, typically less then 5 ug/l during 2000 monitoring, in small soil and shallow bedrock groundwater plumes. These contaminant plumes are captured and treated by the Area B ICM, pumping contaminated groundwater from the shallow bedrock to a carbon adsorption treatment system. The discharge from this treatment unit is under permit to an on-site leachfield.

In the SEQ, B/330 and Landfill AOCs, the silt/clay unit is mostly absent except for several small areas (See Plate 2). Although some soil groundwater is perched on this unit, the soil groundwater elevations in B/330 AOC are primarily for the till overlying bedrock. This till contains the B/330 and landfill AOC soil groundwater contaminant plumes that are controlled and captured by the deep bedrock production wells. Also, a DNAPL source located beneath the south-central portion of Building 330D within AOC B/330 is being recovered by pumping soil groundwater well 572 (See Plate 4). The SEQ contains an elongated soil/shallow bedrock plumes of PCE-series compounds with the highest concentration of 20 ug/l detected at the former contractor's yard during 2000 monitoring. IBM expects to complete construction on an ICM containment system in 2001 that will pump contaminated groundwater from the shallow bedrock to the on-site IBM Central Carbon Treatment Facility that now treats all extracted contaminated bedrock groundwater at the East Complex.

Hydraulic containment of the contaminated groundwater occurs in the deep bedrock and encompasses the East Complex and at least the eastern half of the West complex. As depicted on the deep bedrock elevation contour map of Plate 3 , hydraulic capture or containment can be divided into five distinct areas controlled by pumping at the six deep bedrock production wells. The effect of this pumping is to contain and capture the deep bedrock groundwater contamination as well as the soil/shallow bedrock contamination at several AOCs that have a strong vertical hydraulic connection to the deep bedrock groundwater. All contaminated groundwater captured by the production wells is piped to the IBM Central Carbon Treatment System located at Building 316. From here the treated water is either used on-site or discharged to Gildersleeve Brook.

At the B/330 AOC, soil groundwater contaminant plumes are composed primarily of PCE-series compounds ranging from less than 5 ug/l to 1, 000 ug/l during 2000 monitoring. The same PCE contaminants were detected up to 700 ug/l in the shallow bedrock groundwater of the Landfill AOC lying to the south and south-east of the B/330 soil contaminant plumes. The soil/shallow bedrock groundwater contaminant plumes at these two AOCs serve as sources for several contaminant plumes in the underlying deep bedrock. However, pumping of the deep bedrock production wells in the vicinity of those two AOCs induces steep vertical gradients in their soil/shallow bedrock groundwater. This induced vertical flow acts to control migration and to capture the contamination found in the soil/shallow bedrock contaminant plumes of the B/330 and Landfill AOCs. Similar vertical hydraulic connections exists between the deep bedrock and some of the primarily PCE-series compound contaminated soil groundwater sources occurring in parts of AOC Area A.

A focused corrective measures study (CMS) based on results from a large diameter deep bedrock extraction well was approved in March 2001. The approved CMS recommends pumping this well for enhancing source control at the B/330 AOC contaminant plume and treating the extracted water in the Central Carbon Treatment System. In 2000, approximately 10,460 pounds of volatile organic compounds (VOCs) were removed from approximately 370 million gallons of groundwater pumped from the soil/shallow bedrock and deep bedrock remediation areas. Since 1979, when groundwater remediation was first implemented at IBM East Fishkill, about 180 tons of VOCs have been removed from about 7.6 billion gallons of extracted groundwater.

References.

Groundwater Monitoring Plan, Groundwater Sciences Corporation and IBM Environmental Engineering, February 1996, revised October 1999.
1995 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, July 26, 1996.
1996 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 29, 1997.
1997 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 22, 1998.
1998 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 26, 1999.
1999 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 30, 2000.
2000 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 30, 2001.

Footnotes:

[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_X_ If yes - continue after identifying potentially affected surface water bodies.

___ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

___ If unknown - skip to #8 and enter "IN" status code.

Rationale.

Shallow groundwater seasonally discharges to surface water in limited areas of the site via an unregulated central drainage (H-95-9A) and the Gildersleeve Brook (H-95-9). Monthly monitoring of these surface waters at five locations, including IBM's Outfall 001, indicates that VOCs are detected at concentrations below 6NYCRR Part 703 standards for surface water.

References. New York State Permit Discharge Elimination System (SPDES) Permit, Discharge Monitoring Reports (DMRs) and surface water monitoring database.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

   _X_ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

   _____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

   _____ If unknown - enter "IN" status code in #8.

Rationale.
Shallow groundwater seasonally discharges to surface water in limited areas of the site via an unregulated central drainage (H-95-9A) and the Gildersleeve Brook (H-95-9). Monthly monitoring of these surface waters at five locations, including IBM's Outfall 001, indicates that VOCs are detected at concentrations below 6NYCRR Part 703 standards for surface water. Additionally, shallow groundwater monitoring wells adjacent to H-95-9 and H-95-9A indicate no groundwater concentrations greater than 10 times the 6NYCRR Part 703 groundwater standards.

References.
1995 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, July 26, 1996. *1996 Annual Corrective Action Status Report,* Groundwater Sciences Corporation and IBM Environmental Engineering, May 29, 1997.
1997 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 22, 1998.
1998 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 26, 1999.
1999 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 30, 2000
SPDES DMRs and surface water monitoring database
2000 Annual Corrective Action Status Report, Groundwater Sciences Corporation and IBM Environmental Engineering, May 30, 2001.
Footnotes:
[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

____ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

____ If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):
Not applicable, see question 5.
Footnotes:
[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.
[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

__X__ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

____ If no - enter "NO" status code in #8.

____ If unknown - enter "IN" status code in #8.

Rationale.
6NYCRR Part 373 permit and the associated Groundwater Monitoring Plan for the IBM East Fishkill facility require groundwater sampling at 165 locations at frequencies ranging from monthly to annually and groundwater elevation measurements of 387 wells quarterly to confirm hydraulic control and containment of the on-site contaminated groundwater. Both the overburden soil and bedrock groundwater will be monitored until the States Groundwater Protection Standards have been met in all groundwater monitoring wells for a period of three consecutive years following the termination of the pumping system. As the contaminant plumes reduce in size and Standards are met for three consecutive years in wells determined no longer to be in the path of the plumes, then such wells could qualify for closure.

References.
6NYCRR Part 373 Permit, IBM East Fishkill facility, New York State Department of Environmental Conservation, September 29, 1995.
Groundwater Monitoring Plan, Groundwater Sciences Corporation and IBM Environmental Engineering, February 1996, revised October 1999.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

   X YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the **IBM-East Fishkill Facility, EPA ID #NYD000707901**, located at **2070 Route 52, Hopewell Junction, NY 12533.** Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

   ___ NO - Unacceptable migration of contaminated groundwater is observed or expected.

   ___ IN - More information is needed to make a determination.

Completed by: Date: September 10, 2001

Keith Gronwald
Project Geologist
New York State Department of Environmental Conservation (NYSDEC)

And

Date: September 10, 2001

Steve Kaminski
Chief, Eastern Engineering
NYSDEC

Supervisor: Date: September 10, 2001

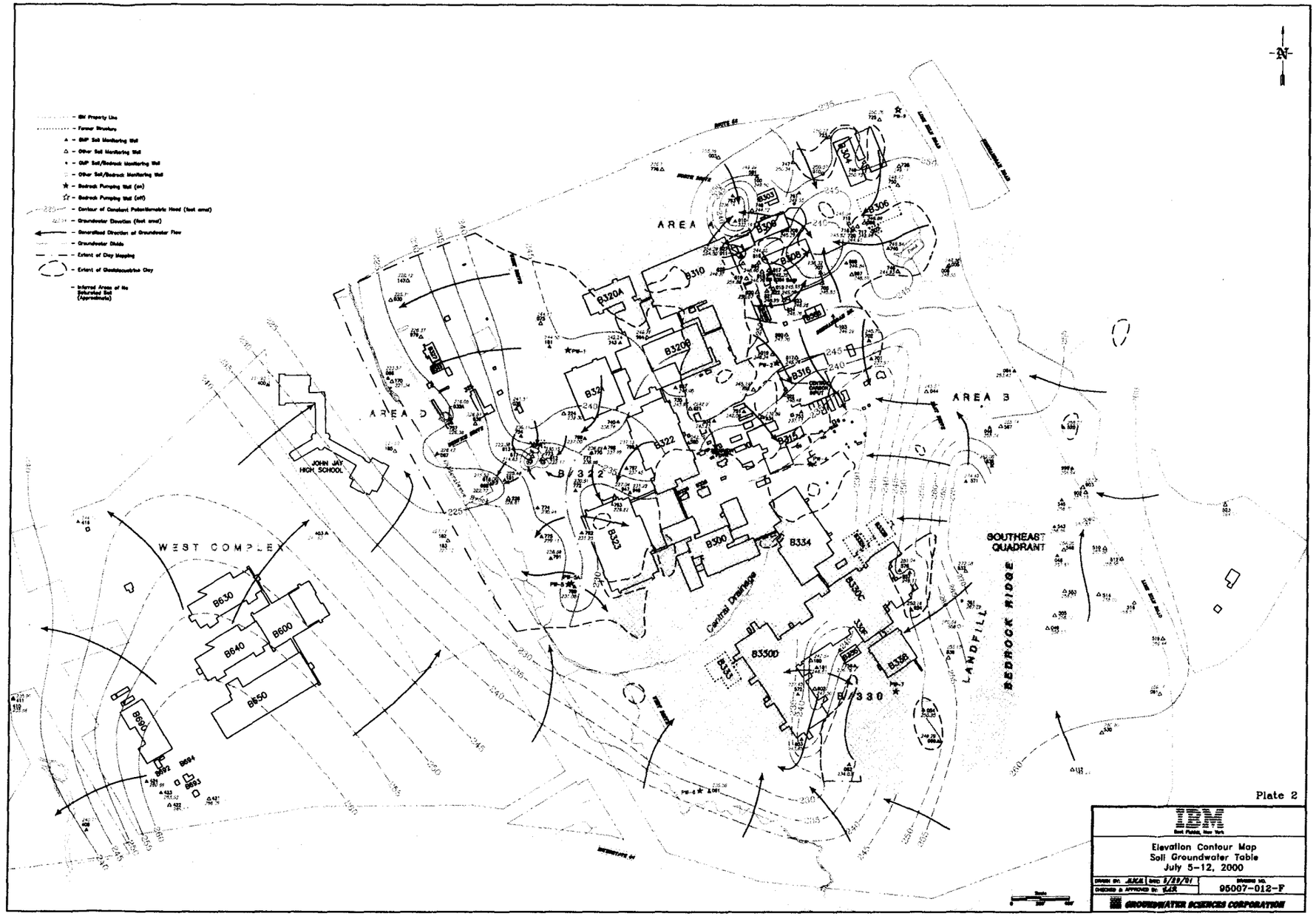
Paul J. Merges
Director, Bureau of Radiation and Hazardous Site Management
NYSDEC

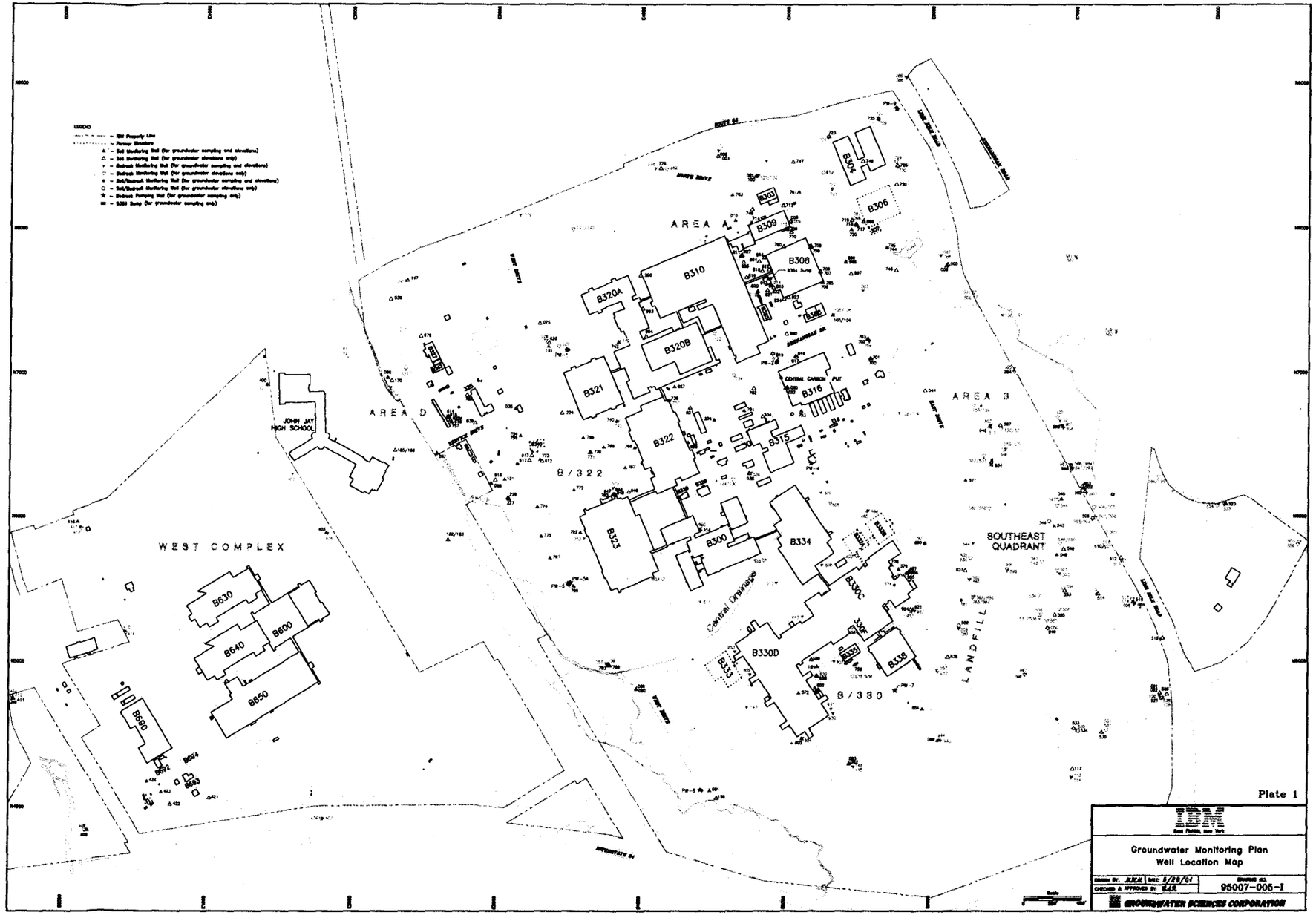
Locations where References may be found:

NYSDEC
Division of Solid and Hazardous Materials
625 Broadway 8th Floor
Albany, NY 12233-7252

Contact telephone and e-mail numbers

Keith Gronwald
(518) 402-8594
E-Mail: khgronwa@gw.dec.state.ny.us


IBM Property Line
Former Structure
SMP Soil Monitoring Well
Other Soil Monitoring Well
SMP Soil/Bedrock Monitoring Well
Other Soil/Bedrock Monitoring Well
Bedrock Pumping Well (on)
Bedrock Pumping Well (off)
Contour of Constant Potentiometric Head (feet amsl)
Groundwater Elevation (feet amsl)
Generalized Direction of Groundwater Flow
Groundwater Divide
Extent of Clay Mapping
Extent of Glaciolacustrine Clay
Inferred Areas of No Saturated Soil (Approximate)
AREA A
AREA B
AREA D
WEST COMPLEX
SOUTHEAST QUADRANT
BEDROCK RIDGE
LANDFILL
JOHN JAY HIGH SCHOOL
B304
B306
B308
B310
B316
B320A
B320B
B322
B323
B324
B330
B330C
B332
B334
B335
B336
B500
B600
B630
B640
B650
B660
B661
B662
B663
B664
Central Drainage
Plate 2
IBM
East Fishkill, New York
Elevation Contour Map
Soil Groundwater Table
July 5-12, 2000
DRAWN BY: JLK/R | DATE: 8/29/01
CHECKED & APPROVED BY: SLR
DRAWING NO. 95007-012-F
GROUNDWATER SCIENCES CORPORATION


LEGEND
IBM Property Line
Fence/ Structure
Soil Monitoring Well (for groundwater sampling and elevations)
Soil Monitoring Well (for groundwater elevations only)
Bedrock Monitoring Well (for groundwater sampling and elevations)
Bedrock Monitoring Well (for groundwater elevations only)
Soil/Bedrock Monitoring Well (for groundwater sampling and elevations)
Soil/Bedrock Monitoring Well (for groundwater elevations only)
Bedrock Pumping Well (for groundwater sampling only)
B384 Sump (for groundwater sampling only)
AREA A
AREA B
AREA C
AREA D
AREA E
AREA 3
WEST COMPLEX
SOUTHEAST QUADRANT
LANDFILL
JOHN JAY HIGH SCHOOL
B/322
B/330
B304
B303
B306
B309
B308
B384 Sump
B310
B320A
B320B
B321
B322
B316
B315
B323
B300
B334
B330C
B330D
B330E
B330
B338
B331
B630
B600
B640
B650
B680
B682
B683
B684
Central Drainage
Plate 1
IBM
East Fishkill, New York
Groundwater Monitoring Plan
Well Location Map
Drawn By: JLK1 Date: 5/25/01
Checked & Approved By: WJR
Drawing No. 95007-005-I
GROUNDWATER SCIENCES CORPORATION