DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRAInfo code (CA725)

Current Human Exposures Under Control

Facility Name: **IBM-Endicott**
Facility Address: **1701 North Street, Endicott, New York**
Facility EPA ID #: **NYD002233039**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, 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 #6 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EIs) 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 EIs 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 "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "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 EIs are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

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

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	_x_	___	___	See discussion below and figures.
Air (indoors)[2]	_x_	__	___	
Surface Soil (e.g., <2 ft)	___	_x_	___	
Surface Water	___	_x_	___	
Sediment	___	_x_	___	
Subsurf. Soil (e.g., >2 ft)	___	_x_	___	
Air (outdoors)	_x__	__	___	See discussion below and figures.

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__x__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Background Setting

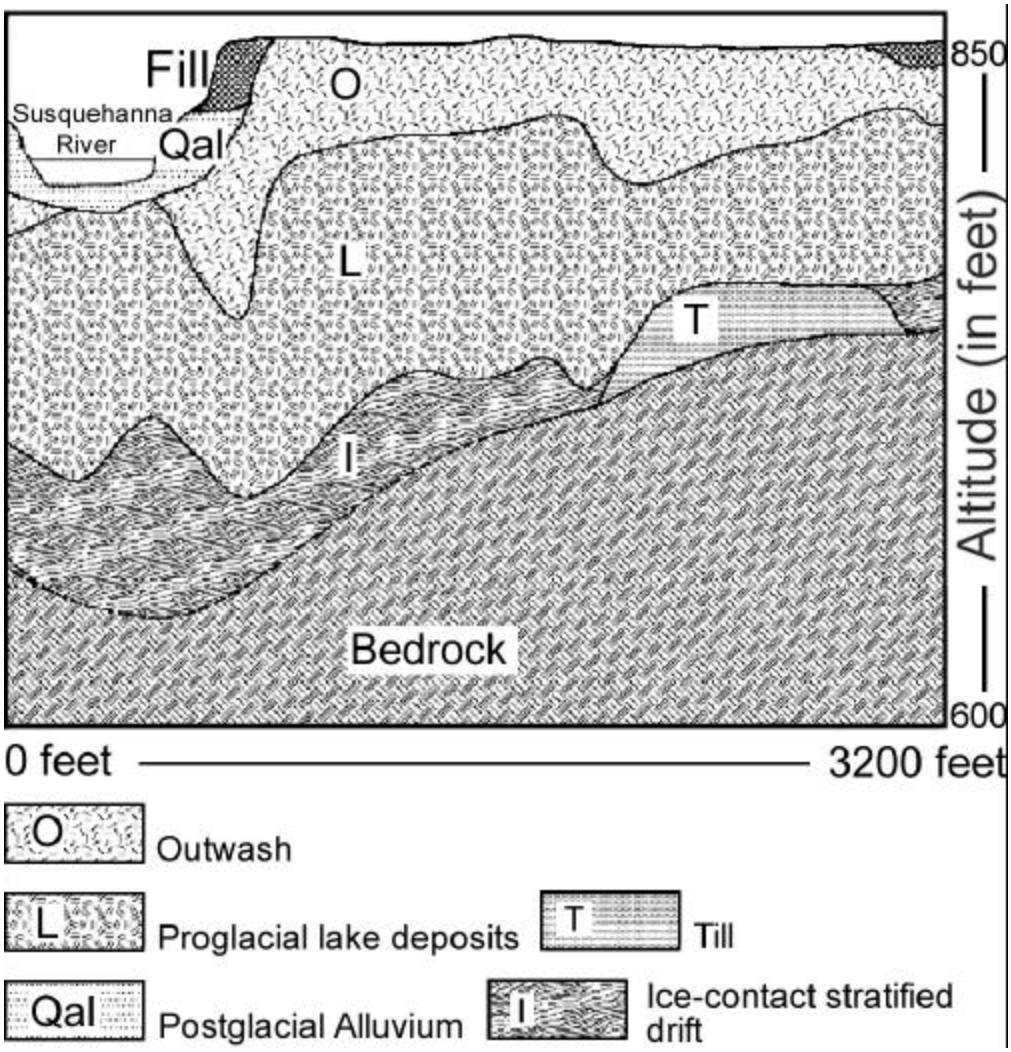
The Village of Endicott (pop. 13,500) is situated within the Susquehanna River valley in upstate New York. The geology of the river valley reflects the influence of the advance and retreat of Pleistocine ice sheets. The aquifers that have been contaminated are part of a sequence of unconsolidated ice-contact and ice-margin deposits. Coarse-grained stratified drift (lower aquifer) and till form the basal units of the unconsolidated sediments. Those sediments are overlain, respectively, by glaciolacustrine silts and by outwash sands and gravels (upper aquifer) that were deposited as the ice sheet retreated up the valley. Randall (1986) provides both a detailed description of the genesis and distribution of the unconsolidated sediments and an aquifer model that simulates horizontal flow through the upper outwash and lower ice-contact deposits and vertical flow through the glaciolacustrine silts and clays that separate the two aquifers.

The lower aquifer serves as a municipal water supply for the Village of Endicott and Town of Union. In the area downgradient of the former IBM facility the lower aquifer is contaminated with low level concentrations of VOCs of unknown origin. The public water supply systems include a treatment process to remove the VOCs prior to distribution.

The IBM -related contaminant plume appears to be confined to the upper aquifer (which does

not serve as a drinking water supply). Although the ongoing groundwater remediation program has kept much of the contaminant mass from leaving the industrial source area near the northern edge of the valley, contaminated groundwater flows southward from the site through the outwash sands and gravels that comprise the uppermost aquifer and discharges to the Susquehanna River about 4,000 feet down gradient. The depth to the water table in the plume area is typically 25 to 40 feet. Figure 1 is a geologic cross-section that depicts the nature of the regional geology.

FIGURE 1: ENDICOTT AREA GEOLOGIC CROSS-SECTION



Property use distribution within the study area consists of about 80% residential and 20% multi-use, commercial and institutional structures. All of the structures utilized public water and sewers. Many of the residential areas were developed during and after the World War II era.

Groundwater

In 1979, IBM Endicott reported a spill of the solvent TCA (1,1,1-trichloroethane, also known as methyl chloroform), a commonly-used VOC. A comprehensive hydrogeologic investigation subsequently indicated a larger than expected groundwater contaminant plume containing TCA and other industrial solvents, trichloroethene (TCE); tetrachloroethene (PCE); dichloroethane (DCA); dichloroethene (DCE); methylene chloride; vinyl chloride, and freon 113 had migrated from the facility. (Those solvents are no longer used at the facility.) The degree of contamination is highest in the vicinity of the manufacturing complex along the railroad area between Watson Boulevard and North Street and diminishes with distance from the IBM plant site. In the time period from early 1979 to the end of 2004, approximately 370 wells have been installed as part of the Resource Conservation Recovery Act (RCRA) corrective action program or ongoing investigations at this Site, 88 of which were installed during 2004. The total includes 141 wells (monitoring and extraction) installed north of North Street on the former IBM facility at the Site, and another 229 wells (monitoring and extraction) installed south of North Street off the former IBM facility at the Site.

Groundwater remediation began in 1980 and continues today. The ongoing groundwater remedial program consists of pumping wells to capture the contaminated groundwater so it can be treated to remove the VOCs. Since 1980, extraction operations have been performed at twenty-two extraction wells operating over various time periods. As of December 31, 2004, approximately 788,000 pounds of VOCs have been removed by extraction operations.

Although groundwater data indicate that this program has been effective, it typically takes many years, or even decades, to clean up groundwater. In 2004, the NYSDEC transferred regulatory oversight from the state's RCRA program to the Environmental Remediation program. Subsequently, an Administrative Order on Consent was executed between the NYSDEC and IBM. Under the Order, IBM is currently evaluating ways to expedite groundwater source containment and removal, as well as other potential enhancements to the groundwater remedial program that would shrink the plume as quickly as possible.

Figures that depict the groundwater potentiometric surface and total voc distribution in the upper aquifer are attached.

Soil Vapor Intrusion

Off-Site

The groundwater contaminant plume flows directly beneath the center of the Village of Endicott and serves as a source of soil vapor contamination that affects many of the buildings above it. In May 2002, IBM began an initial program of investigation and testing to assess the potential for vapor intrusion into structures near the former IBM facility. This assessment was initiated as a routine component of the RCRA Environmental Indicators initiative, and include concurrent sampling and analysis of groundwater, soil, and subsurface soil vapor. The resultant analysis indicated the presence of certain VOCs in soil vapor at concentrations indicative of the potential for vapor intrusion into nearby structures. Based on the available soil vapor and groundwater data, IBM undertook an investigation to

evaluate vapor intrusion potentially attributable to the VOC presence in groundwater in the vicinity of the former IBM facility.

An approach to complete this evaluation of vapor intrusion potential was developed in consultation with the NYSDEC and NYSDOH. In December 2002 a foundation-level soil vapor survey was conducted across and outside of certain areas where VOCs were historically detected in groundwater in the vicinity of the former IBM facility. The work included collection and laboratory analysis of soil vapor at foundation depth to provide the basis for refining the Investigative Area.

The vapor intrusion assessment was carried out initially in an area where the highest potential for vapor intrusion was expected to exist, then moved sequentially outward to areas of lower relative vapor intrusion potential as perceived through the available data. The goal was to assess the entire Investigative Area in one heating season to identify the presence or absence of vapor intrusion potential warranting ventilation and expeditiously begin installing ventilation systems where appropriate. The vapor intrusion sampling included concurrent collection and analysis of indoor air, ambient air, and substructure soil vapor. The target VOCs that were selected for analysis included eleven compounds that had been historically observed in groundwater IBM was remediating.

During the 2002/2003 heating season, data obtained from sampling of 233 structures were used to establish the areal extent of structures where ventilation systems would be offered to building owners under the state approved criteria. As a result of that effort, approximately 99% of the properties qualifying for ventilation were identified. Subsequently, vapor intrusion sampling events conducted during the next two (2003/2004 and 2004/2005) heating seasons involved sampling of 144 structures just outside the Limits of Ventilation to confirm that the Limits of Ventilation were appropriate (confirmatory sampling). As of September 2005, IBM has installed a total of 490 ventilation systems at 434 properties.

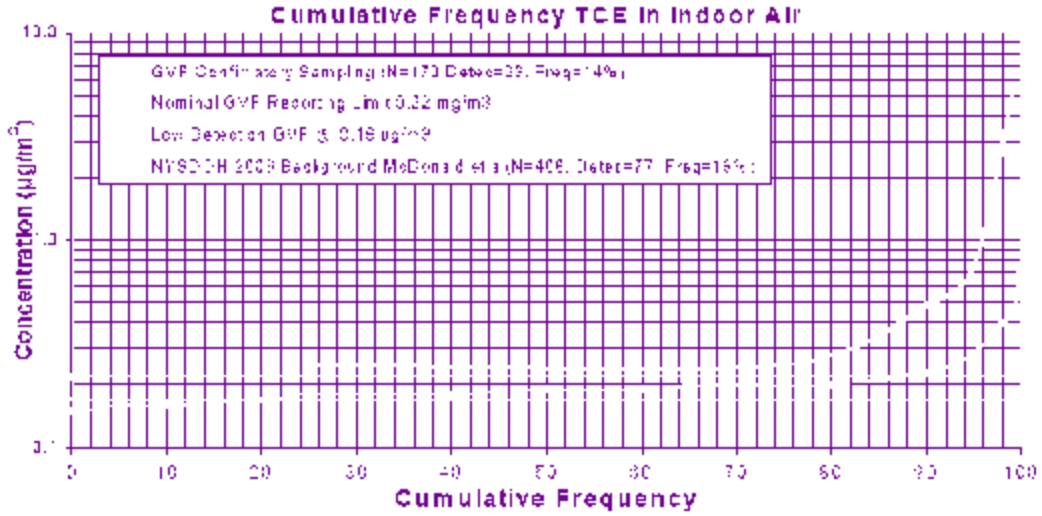
Figures depicting the nature and extent of VOC vapor contamination and the extent of the IBM "ventilation area" are attached. In addition a figure that depicts the cumulative frequency distribution of indoor air sampling results from structures outside of the IBM ventilation is shown below. As can be seen from this figure, the concentration of TCE in the indoor air in those structures is essentially the same as the NYSDOH background concentration of TCE in homes unaffected by any known soil vapor contaminant source. It supports the conclusion that off-site human exposures associated with the IBM related vapor plume have been satisfactorily addressed. In addition, IBM has implemented a long-term vapor monitoring program and OM&M program to continue to assure that off-site human exposures are under control.

During the course of the off-site vapor intrusion investigation, vapor sources unrelated to the IBM plume were identified. The NYSDEC and NYSDOH are in the process of investigating those sources and implementing a structure monitoring and mitigation program to address human exposures.

On-Site

In January 2005, the NYSDEC collected a total of 259 samples from beneath, within and outside of the forty two occupied buildings on the Huron (former IBM) facility. The sampling results

indicate that VOCs are present in the soil gas and low level concentrations are present in indoor air (typically in basement samples) in about 50 % of the buildings. In nine buildings, the indoor concentration of TCE exceeded the NYSDOH guideline of 5 mcg/m3. Although the concentration of TCE in some basement samples was as high as 200 mcg/m3 , the highest concentration of TCE in indoor air in frequently occupied areas of buildings was 19 mcg/m3. The NYSDEC and the NYSDOH are currently reviewing the data to determine what actions are recommended to address on-site vapor intrusion related exposures.



References:

- Supplemental Groundwater Assessment Final Report, May 2004
- Randall, A.D. 1986. Aquifer Model of the Susquehanna River Valley In Southwestern Broome County, New York. Water-Resources Investigations Report 85-4099. Washington, DC, U.S. Geological Survey.
- Groundwater Monitoring Status Reports (submitted semi-annually).
- Summary Report, Groundwater Vapor Project, Endicott NY June 2005
- See NYSDEC website for detailed maps and figures and data http://www.dec.state.ny.us/website/der/projects/endicott/endicottsampling.htm

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 appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRAInfo code (CA725)

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

	Potential **Human Receptors** (Under Current Conditions)						
"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	No	No	No	No	No	No	No
Air (indoors)	No	**Yes**	No	No	No	No	No
Soil (surface, e.g., <2 ft)	No	No	No	No	No	No	No
Surface Water	No	No	No	No	No	No	No
Sediment	No	No	No	No	No	No	No
Soil (subsurface e.g., >2 ft)	No	No	No	No	No	No	No
Air (outdoors)	No	No	No	No	No	No	No

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

__X___ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

See discussion regarding on-site indoor air data

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

At this point, the only complete exposure pathway is for on-site indoor air which may be related to vapor intrusion.

The areas where off-site vapor intrusion associated with the IBM-related groundwater plume have been identified and IBM has initiated a remedial program, including installation of 490 mitigation systems to address the exposures.

Although a plume of contaminated groundwater extends off-site in the Village of Endicott, IBM's corrective measures program is addressing the groundwater contamination, and has significantly reduced the size of the contaminant plume and the concentrations of contaminants in groundwater. These groundwater remedial systems recover and treat approximately 122 million gallons of contaminated groundwater annually, resulting in the removal of approximately 3900 pounds of contaminant mass, annually.

A Village ordinance requires that all water users be on public water supply. On-site construction workers are protected by Substantial Change in Use Notification requirements (required under NYCRR 375 regulations). This would require IBM to evaluate all invasive on-site construction projects and to take precautions for health and safety. Accept for a few on-site locations, the depth to groundwater is greater than 8 feet, and therefore, off-site construction workers would be unlikely to encounter groundwater.

References:

- Summary of Groundwater Conditions at Main IBM Facility, December 15, 1987.
- Groundwater Monitoring Status Reports (submitted semi-annually).
- NYSDEC Preliminary Site Investigation Report, Huron Real Associates LLC. (Indoor Air Sampling of the former IBM Endicott Facility , September 2005)

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Current Human Exposures Under Control
Environmental Indicator (EI) RCRAInfo code (CA725)

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

_____ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

__X___ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

As stated in the discussion above, the concentration of TCE in indoor air exceeds the NYDSOH value of 5ug/m3.

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5 Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

__x__ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):____From the NYSDEC and NYSDOH perspective, with the exception of on-site indoor air, all potential exposures are under control. It should be noted that New York State and the USEPA, for the purposes of this EI determination, use different criteria when determining whether the on-site indoor air exposures are acceptable.

EPA's Office of Solid Waste and Emergency Response (OSWER) issued "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils" in November 2002. Among the exposure scenarios discussed in this draft guidance, EPA addressed vapor intrusion into non-residential buildings, including those in occupational settings that may be regulated by the Occupational Health and Safety Administration (OSHA). Specifically, in the Introduction of the Draft Guidance, under Section I.D. ("What Is The Scope of The Guidance?"), OSWER states that "OSHA and EPA have generally agreed that OSHA will take the lead in addressing occupational exposures", and that "…EPA does not expect this guidance to be used for settings that are primarily occupational." OSWER reaffirmed this position in a fact sheet titled "Vapor Intrusion and RCRA Corrective Action Environmental Indicators (EI)," issued June 2003.

However, at this time, OSWER is reevaluating the guidance for the vapor intrusion to indoor air pathway in occupational settings. The matter is currently under internal review. OSWER plans to issue updated recommendations on when and how the Draft Guidance should be used.

For purposes of this Human Exposures Under Control EI determination, EPA Region 2 is deferring the determination of whether an unacceptable exposure to human health exists from the vapor intrusion to indoor air pathway in the on-site occupational setting at IBM Endicott. Once new draft guidance is issued by OSWER, EPA Region 2 expects to recommend that the vapor intrusion to indoor air pathway be reevaluated at IBM Endicott to determine if this pathway poses an unacceptable risk to human health in the occupational setting. This deferral applies only to the vapor intrusion to indoor air pathway in the on-site occupational setting exposure scenario.

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_X_ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the IBM facility, EPA ID # NYD002233039, located at 1701 North Street, Endicott, New York under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

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

EPA Project Manager: _____ Date: _____

Michael Infurna
New York Section
USEPA Region 2

Supervisor: _____ Date: _____

James Reidy, Chief
RCRA Program Branch - NY Section
USEPA Region 2

Supervisor: Original signed by: Date: September 30, 2005

Adoph Everett, Chief
RCRA Program Branch
USEPA Region 2

Director: _____ Date: _____

Walter Mudgan, Director
Division of Environmental Planning and Protection
USEPA Region 2

Locations where References may be found:

New York State Department of Environmental Conservation, Central Office
625 Broadway 12th Floor
Albany, New York 12233-7252

Contact telephone and e-mail numbers

NYSDEC
(name) William E. Wertz, Ph.D
(phone #) (518)402-9813
(e-mail) wewertz@gw.dec.state.ny.us

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.