July 18, 2006

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99

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

Migration of Contaminated Groundwater Under Control

Facility Name:	**PPG Industries Inc.**
Facility Address:	**4829 Fairland Road, Barberton, Ohio 44203-3913**
Facility EPA ID #:	**OHD 004-198-917**

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?

Y 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 (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?

Y 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.

Primary constituents of concern at the PPG Barberton Facility are organics, and dissolved solids in sitewide groundwater.

Main Plant Area (North Plant, South Plant, Lime Lake 1, Lime Lake 2, Lime Lake 3, Sand Quarry, and Contractors Landfill) groundwater have measured concentrations of tetrachloroethene (PCE), trichloroethene (TCE), cis-dichloroethene (DCE), and vinyl chloride (VC) above Federal MCLs. Total dissolved solids (TDS) are elevated above secondary drinking water standards. Not as extensive, and primarily associated with Lime Lake 2, North Plant, South Plant, and the Contractors Landfill, are carbon tetrachloride, chloroform, and dichloromethane concentrations in groundwater above Federal MCLs. Hexachlorobenzene in groundwater is elevated above MCLs in the North and South Plant and Lime Lake 2 areas. MCL's are standards that are applicable to public water supplies. The aquifer under the PPG facility is not currently used in any public water distribution system.

Southern Lime Lakes Area (Lime Lakes 4, 5, and 6) groundwater contains much reduced concentrations and extent of PCE, TCE, cis-DCE, and VC. There are elevated TDS concentrations in groundwater.

References: The most current facility wide groundwater quality is documented in the Sitewide Groundwater Monitoring Program, First Year Data Report (Shaw, January 2006) and second year data report letter dated October 13, 2005.

[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)?

Y — 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.

The migration of contaminated groundwater is stabilized and is expected to remain within the area of monitoring locations.

Sitewide groundwater monitoring conducted in 2003 and 2004 documented the spatial stability of the impacted groundwater when compared to the 1994 RFI data. Based on the data trends and observations from 17 monitoring wells located adjacent to Wolf Creek and the Tuscarawas River (with LL2-08AV2 being substituted for LL2-08A) where concentration of primary COCs show stable or decreasing trends and one monitoring well (LL2-11A) showing stable or decreasing concentrations for PCE, TCE and cis-DCE and an increasing concentration trend for vinyl chloride. (page 3-4, Shaw, January 2006). The increasing vinyl chloride is expected, since it is caused by the reductive dechlorination of PCE and TCE, and does not appear in the adjacent Tuscarawas River.

Groundwater is present in a glacial outwash/bedrock aquifer. Groundwater flow is controlled by the physical boundaries of the valley and the presence of surface water drainages. Local groundwater flow patterns are complex but flow is generally from the upland areas, dominated by bedrock highs, to the major surface water streams. The rate and direction of groundwater flow and solute transport were extensively studied during the RFI and documented (IT Corporation, 1997). Monitoring wells

[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.

were sited to measure groundwater elevations and the magnitude and extent of contaminated groundwater throughout the study area.

Groundwater flow and solute transport computer modeling was conducted at the PPG facility during the RFI and CMS. The model was developed, calibrated, and sensitivity analysis performed following the USEPA approved work plan developed during the RFI. The modeling was conducted using the U.S Nuclear Regulatory Commission computer code SWIFT 486 after a review of available model codes. The model was peer reviewed by in-house IT experts in computer modeling and by third party experts (GeoTrans, Inc.). The groundwater flow and solute transport model code selection, development, calibration, peer review, and documentation are presented in Attachment E-6 (Groundwater Flow and Solute Transport Modeling), Appendix E (Site wide Groundwater and Surface Water) of the RFI Report. USEPA has reviewed the modeling, hired outside agency consultants to review the model (US Geological Survey), and approved the modeling along with other RFI documents. Application of the groundwater flow and solute transport model has been documented in various deliverables to the Agency such as the MNA pilot test. Other correspondence has been forwarded to the USEPA as it was developed (e.g., GeoTrans Peer Review Report).

During the RFI, PPG surveyed off-site wells within a one half mile radius of the facility. Selected wells were sampled for VOCs, wet chemistry parameters, and selected metals. Analytical results were compared to primary and secondary drinking water standards as well as background concentrations. The results were; the vast majority of the off-site wells (108 of 115) sampled met USEPA primary drinking water standards. Only one well had an organic compound detection above a USEPA drinking water standard and this occurrence was not attributed to PPG.

References: RCRA Facility Investigation (RFI), IT Corporation, 1997: Appendix E , Sitewide Surface Water and Groundwater Report; Appendix E, Attachment E-6, Groundwater Flow and Solute Transport Modeling Report; Appendix U, Off-Site Well Sampling. And Sitewide Groundwater Monitoring Program, First Year Data Report, Shaw Environmental Inc., January 2006.

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

Y

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.

Potentially affected surface water bodies include; Wolf Creek, Lower Hudson Run, and Tuscarawas River.

As documented in the RFI groundwater discharges to local surface water bodies including Wolf Creek, Lower Hudson Run and Tuscarawas River. In Hudson Run Reservoir (HRR) surface water has been shown to discharge to groundwater by actual piezometer water level readings taken after the RFI work was performed. HRR surface water meets state water quality criteria as documented in the sediment cap performance sampling.

As documented in the Water Quality Assessment of the Tuscarawas River, 2001 (Exponent, 2001), surface water contains low levels of site related VOCs.

References: Appendix E of the RFI, Sitewide Surface Water and Groundwater Report and Appendix E, Attachment E-6, Groundwater Flow and Solute Transport Modeling Report. The Water Quality Assessment of the Tuscarawas River, 2001 (Exponent, 2001). HRR Performance Sampling Report, September 15, 2005.

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)?

___ 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.

N 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.

Primary sitewide groundwater chemical constituents, detected in the wells located adjacent to Wolf Creek and the Tuscarawas River during 2003, 2004 and 2005 (page 3-4, Shaw, January 2006 and Letter dated October 13, 2005), were screened against Ohio Aquatic Life Outside Mixing Zone Average (OMZA) and Human Health Non-Drinking surface water criteria.

Included with this document are the groundwater data screens performed to evaluate the potential groundwater discharge into surface water significance at the Barberton Facility for the CA-750 Environmental Indicator Determination. The screens were performed on the previously identified 18 site wide groundwater monitoring (SWGW) wells located near the Tuscarawas River. The data screened were from the first and second year SWGW monitoring (2003 through 2005).

The screening was performed using 10 times the Ohio Environmental Protection Agency (OEPA) Outside Mixing Zone Average (OMZA) and Human Health (HH) non-

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

drinking criteria for Ohio River Basin surface water, dated July 27, 2005. The metals criteria selected were based on what was provided in the OEPA tables; dissolved criteria, total values, and total recoverable values. When the metals criteria were hardness dependent (i.e., cadmium, chromium, copper, lead, nickel, and zinc), the hardness value of 200 mg/L was used to select the screening value. When the criteria were pH dependent (e.g., pentachlorophenol), the value of 7.5 was used to select the screening value. The river hardness and pH values were selected after reviewing the 2001 Water Quality Assessment of the Tuscarawas River (Exponent June 2002) and Tuscarawas water quality data provided by OEPA (OEPA Interagency Communication to USEPA March 30, 2006).

The attached screening spreadsheet contains four sections. The first section, "Criteria Summary", lists the OMZA and HH screening values. The second section, "Criteria Explanation", provides the screening parameters which were hardness or pH dependent, or which varied from the dissolved criteria. The third section, "Samples in Screen", provides a list of the 18 wells and their associated SWGW sample results included in the screen. The fourth section, "Screen", provides the results of the screen. This screen-results page summarizes the well locations and parameters where groundwater concentrations exceeded 10 times the appropriate surface water quality criteria.

Cyanide was not included in the data screen, since the OEPA water quality criteria is for "Free Cyanide," which was not analyzed. Free cyanide is defined as: cyanides that are present in the form of HCN or CN^- in aqueous solutions of pH 6. This would include simple cyanides such as sodium, potassium, and ammonium salts, but not complex cyanides such as copper, silver, zinc, and iron salts. The analytical method used to determine cyanide in groundwater for the SWGW sampling was for total cyanide, not the amount that would freely dissociate in water. The OEPA Interagency Communication dated March 30, 2006 provided Tuscarawas River data for cyanide and stated "concentrations are negligible".

Seven wells had one or more analytical parameters which exceeded the screening criteria. Most of the parameter exceedances were associated with two monitoring wells (LL2-02B* and LL2-11A). The screening criteria exceedances were related to seven analytical parameters, some of which exceeded both OMZA and HH criteria, so the more stringent criteria was used for comparison. These included: barium (three exceedances in two wells), hexachloroethane (one exceedance in one well), mercury (five exceedances in four wells), tetrachloroethene (one well exceeded both criteria five times), total dissolved solids (two exceedances in one well), trichloroethene (one well exceeded both criteria four times), and vinyl chloride (four exceedances in one well).

Trends in groundwater concentrations for these 18 wells were also reviewed. Based on the Sitewide Groundwater Monitoring Program, First Year Data Report findings (page 3-4 of Shaw, January 2006), groundwater concentrations are either stable or declining for all wells except LL6-21A in which barium has increased from the RFI sampling period and LL2-11A where vinyl chloride has been increasing since the RFI sampling.

The seven COIs that exceeded the 10X groundwater screen (barium, hexachloroethane, mercury, tetrachloroethene, total dissolved solids, trichloroethene, and vinyl chloride) were screened against available surface water data (RFI, 2001 Water Quality Assessment). The screening was conducted using one times the OEPA OMZA and HH criteria. The results of the screen showed that of the seven COIs only total dissolved solids are periodically exceeded in the Tuscarawas River adjacent to and downstream of Lime Lakes 2, 3, 4, 5, and 6.

The 10X screen was used for evaluating potential groundwater impacts to the Tuscarawas River. Where the screen was exceeded, actual surface water results were looked at. This approach has previously been used to exclude surface water bodies such as Hudson Run Reservoir and Wolf Creek from consideration.

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])?

Y

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.

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As discussed in question 5 above; the 10X screen OMZA and HH screen was used for evaluating potential groundwater impacts to the Tuscarawas River. Where the screen was exceeded, actual surface water results were looked at. This approach has previously been used to exclude surface water bodies such as Hudson Run Reservoir and Wolf Creek from consideration. The results of the screen showed that of the seven COIs only total dissolved solids are periodically exceeded in the Tuscarawas River adjacent to and downstream of Lime Lakes 2, 3, 4, 5, and 6.

[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.

Measured concentrations of site related organic and dissolved solids chemical constituents in Wolf Creek and organic constituents in the Tuscarawas River surface water are well below State of Ohio water quality standard, OMZA surface water criteria. This is documented in the Phyto remediation for Lime lakes 1 and 2 baseline surface water sampling of Wolf Creek (four quarter sampling in 2002 and 2003) and the Water Quality Assessment of the Tuscarawas River (Exponent, 2001).

TDS were elevated above the OMZA criteria at three Tuscarawas River sampling locations (river miles 107.8, 106.9, and 104.3 downstream of the lime lakes) in September 2001 and one location (river mile 106.9) in October 2001 (Exponent, 2001). The average of the four samples were 1725 mg/L compared to the water quality criteria of 1500 mg/L

The Water Quality Assessment of the Tuscarawas River, 2001 (Exponent, 2001) concluded that "...the overall quality of the fish community in the Tuscarawas River, has improved considerably in the study area since the 1993 and 1995 studies." Further the Exponent report states "The ICI ([sic] invertebrate community index) scores reported for the study area were generally improved over those reported in 1993 and 1995." Further, OEPA reports that the macroinvertebrate community is achieving the biological criteria for the use class even with the river bed reported to be hard pan lime and that this may be a indicator that sediment habitat is improving (John Palmer September 14, 2005 Interagency Communication to USEPA, Allen Debus).

Site related chemical constituents (chloroform, PCE, TCE and TDS) were detected above the surface water OMZA criteria at one backwater location in lower Hudson Run (LHR) in May and August 2004. Downstream sampling (7 times stream width and greater) the detections were well below the OMZA criteria. Additionally, surface water samples taken adjacent to this one location and in-stream, subject to water flow, were also well below the OMZA criteria. These chemical constituents may be due to groundwater seepage into LHR near sampling point SW-03 (LHR Surface Water and Sediment Sampling, May and August 2004, PPG Letter Report February 10, 2005). PPG is currently in the process of designing and installing a second low-head dam in LHR to suppress the contaminated groundwater seepage. In the interim, this seepage is believed to be of low volume and impacting a limited area of surface water.

Hudson Run Reservoir surface water sampling conducted in 2004 and 2005 only detected PCE at a low concentration (3.1 µg/l maximum), well below the surface water OMZA criteria of 53 µg/l (HRR Performance Sampling, May 2004 and 2005 Results, PPG Letter Reports August 31, 2004 and September 15, 2005).

Interim Measures (e.g., Low Head Impoundment in Lower Hudson Run and Leachate Collection System in Lime Lakes 1 and 2 and Contractors Landfill) and voluntary actions (e.g., Reclamation of Lime Lakes 3, 4, 5, and 6 and proposed new low-head dam in Lower Hudson Run) were implemented to reduce discharges of site contamination to acceptable levels.

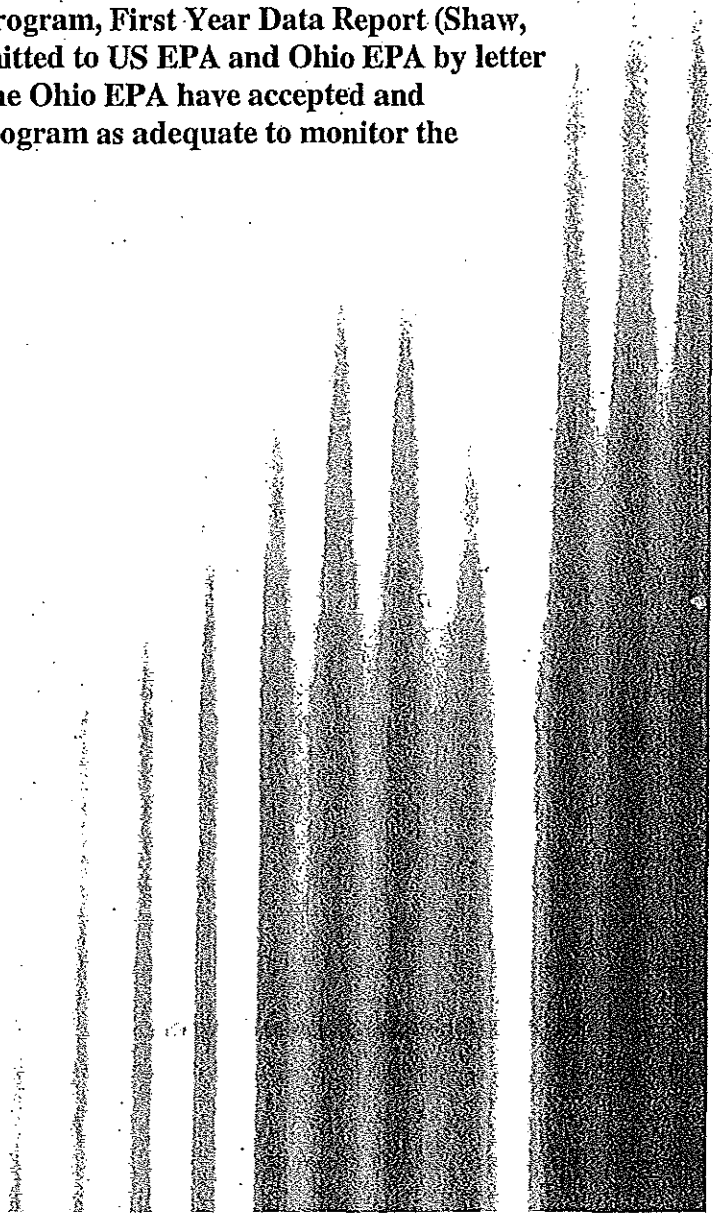
7. Will groundwater **monitoring /** measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

Y — 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.

PPG conducted quarterly groundwater monitoring from November 2003 through August 2004. Subsequent to this monitoring PPG proposed annual groundwater monitoring which was completed in July 2005 and is scheduled for July 2006. The results of the quarterly sampling and proposed annual monitoring are documented in the Sitewide Groundwater Monitoring Program, First Year Data Report (Shaw, January 2006). July 2005 data were transmitted to US EPA and Ohio EPA by letter dated October 13, 2005. The USEPA and the Ohio EPA have accepted and approved these reports and the sampling program as adequate to monitor the existing area of contaminated groundwater.



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).

Y 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 PPG Industries Inc., Facility , EPA ID # OHD 004-198-917, located at_4829 Fairland Road, Barberton, Ohio 44203.** 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 (signature) Allen A Debus Date 1/22/07

(print) Allen Debus

(title) Chemist + Project Mgr.

Supervisor (signature) [signature] Date 1/22/07

(print) HAK K CHO

(title) Chief, CAS

(EPA Region or State) **U.S. EPA – Region 5**

Locations where References may be found:

U. S EPA – Region 5, 77 West Jackson Blvd., Chicago, IL 60604, 8th Floor, Cubicle No. 8087.

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LIME LAKES RECLAMATION PROJECT
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Barberton, OH 44203

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Bill

P.S. (EPA poor originals ----)