



TETRA TECH

**SECOND FIVE-YEAR REVIEW WORK PLAN
PPG CIRCLEVILLE, OHIO FACILITY**

**559 Pittsburgh Road
Circleville, Ohio
Site-Wide Operable Unit
Ohio EPA Master Sites ID No. 165-0641**

July 2011

**Second Five-Year Review Work Plan
PPG Circleville, Ohio Facility**

**559 Pittsburgh Road
Circleville, Ohio
Site-Wide Operable Unit
Ohio EPA Master Sites ID No. 165-0641**

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1.0 INTRODUCTION

On behalf of PPG Industries of Ohio, Inc. (PPG), Tetra Tech NUS, Inc. (Tetra Tech) has prepared this Work Plan for implementation of a Five-Year Review of the Remedial Actions undertaken at the PPG Circleville, Ohio Site (Site), located at 559 Pittsburgh Road in Circleville, Pickaway County, Ohio. The remedial activities at the Site are being conducted in accordance with the *“Director’s Findings and Orders for the Site,”* dated December 21, 1989. Remediation of the Site is considered to have commenced on January 10, 2001, when the Remedial Design/Remedial Action Work Plan (RD/RA WP; MFG, 2001) was approved by the OEPA.

Five Year Reviews are typically conducted for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites where hazardous constituents persist at levels that will not permit unrestricted use of the site. These reviews are conducted every five years until the site no longer contains hazardous constituents at levels that prevent unrestricted use. This Work Plan was prepared for the second Five-Year Review for the Site in accordance with the *“Comprehensive Five-Year Review Guidance,”* (OSWER No. 9355.7-038-P) prepared by EPA in June 2001, and the Five-Year Review Guidelines presented in the 1995 Model Statement of Work provided by the Ohio Environmental Protection Agency (OEPA) and referenced in the Decision Document (DD; OEPA, 1999), and provides the activities and procedures that will be utilized to conduct the Five-Year Review of the Site. The Work Plan also provides a schedule for implementation and identifies key personnel and responsibilities to enable completion of the review.

Section 2.0 of this document provides comprehensive background information related to the Site and subsequent remedial actions. Section 3.0 identifies the work to be performed to complete the review. Section 4.0 establishes a review team for the Five-Year Review and Section 5.0 provides a schedule for completion of the review.

2.0 SUMMARY OF SITE CONDITIONS AND REGULATORY HISTORY

2.1 Site History

The Site is located approximately 30 miles south of Columbus, Ohio and consists of approximately 60-acres of property. The Site is located among farmland, industrial and commercial facilities with some residential areas to the north. The Site property is bounded to the north by a Georgia Pacific facility and farmland, the Night Owl property and Trimold property (formerly Circle Plastics) are located to the northwest. To the east of the Site is the Norfolk Southern Railway, Scippo Creek and farmland, and to the south is Scippo Creek and farmland. To the west of the Site is farmland owned by Pewamo Ltd. (formerly owned by the estate of Mary Virginia Hannan and American Electric Power), Route 23 and the E.I. DuPont de Nemours (DuPont) property.

The PPG Plant began operation in December of 1962 and is still in operation. The plant produces liquid paint resins that are either polymer dispersed or dissolved in a solvent such as water or mineral spirits. The resins are then shipped to other PPG locations where they are combined with pigments and other additives to produce automotive, beverage can, architectural or other industrial paints and coatings. The Circleville plant produces only the resins used in the paints, and does not manufacture the paints themselves.

2.2 Regulatory History

On December 21, 1989, PPG entered into an Administrative Order on Consent (AOC) with the OEPA. The purpose of the Consent Order was to implement a remedial action to address historical releases into the environment from the Site. PPG completed the Remedial Investigation (RI) in 1991 and 1996 to characterize the nature and extent of Site-related constituents, and to evaluate the potential risks to human health and the environment. In 1996, PPG submitted a Feasibility Study (FS) to screen and evaluate viable remedial alternatives for the Site. In 1998, additional groundwater data was collected to update the RI groundwater information. PPG finalized the FS in February of 1999 and the OEPA approved the FS in May of 1999. In September 1999, the OEPA issued a Preferred Plan, which proposed the remedial measures for the Site. In June 2000, OEPA issued the DD, which provides their selected remedial actions for the Site as well as responses to public comments on the Preferred Plan. The DD established a clean-up goal of 35 ug/l for the 1,4-dioxane plume. In response to the

DD, PPG prepared the RD/RA Work Plan (MFG, 2001), which provides the procedures necessary to implement the remedial measures at the Site. PPG also completed and submitted a Five-Year Review Work Plan (MFG, 2006), which was approved by OEPA (OEPA, 2006). PPG subsequently submitted the Draft First Five-Year Review Report in January 2007 (Tetra Tech MM, Inc., 2007) and OEPA is in the process of completing its portion of the report.

2.2.1 Overview of Site Environmental Conditions

Based on the historical operations at the Site and the available environmental data, the RI was designed to determine the nature and extent of Site-related constituents both on- and off-Site. The following paragraphs provide a brief summary of the Site conditions identified in the RI.

Seventeen (17) areas on the Site (Figure 1) were identified and evaluated as potential source areas (PSAs) during the RI. The RI concluded that the extent of Site-related constituents was primarily limited to the individual PSAs except for those associated with PSA-1 (Former Wastewater Pond), some of which migrated off-Site via groundwater.

A baseline risk assessment, completed in 1996, indicated that the risks posed by 16 of the 17 PSAs (PSA-1 and PSA-3 through 17) are acceptable and, therefore, no further action is required. Acceptable risks were exceeded for a hypothetical future construction worker at PSA-2, and for the future residential use of the off-property groundwater, if it were used as a source of drinking water. Both PSA-2 and the off-property groundwater plume were evaluated in the FS for potential remedial alternatives. Constituents of concern in soils at PSA-2 include the volatile organic compounds (VOCs) ethylbenzene, toluene, xylene, and PCB Aroclor 1248. Constituents of concern in off-property groundwater are limited to 1,4-dioxane, although ethylbenzene and xylene are present in groundwater on-Site near the 1,4-dioxane source.

The major source of the constituents in groundwater was the former wastewater infiltration ponds (PSA-1). These ponds no longer act as a source to groundwater as a result of upgrades completed in the 1970s, and their closure in 1980. The constituents that migrated into the shallow groundwater-bearing zone include the VOCs ethylbenzene, toluene and xylene, which have not migrated significantly beyond PSA-1. Physical properties of the shallow groundwater zone, constituent physical properties and natural attenuation have limited the horizontal migration of VOCs. Only 1,4-dioxane has migrated off the PPG property via groundwater at concentrations that exceed risk-based cleanup standards. 1,4-Dioxane is infinitely soluble in water, has limited volatility, and low biodegradability, which makes treatment difficult and contributes to its high groundwater mobility and subsequent off-property migration.

Groundwater occurs in the shallow, intermediate and deep sand and gravel water-bearing zones beneath the Site. The three zones are generally found at depths of 10 to 20 feet, 30 to 60 feet and 80 to 180 feet, respectively. Each zone is separated by clay layers, which impede migration of groundwater and provide an effective barrier to the vertical migration of Site-related constituents to deeper aquifer zones beneath the Site. To the west of the Site, the clay layers are discontinuous, and groundwater can migrate vertically into the deeper aquifer zones. As a result, Site-related constituents (primarily 1,4-dioxane) are present in the deeper portions of the aquifer to the west of the Site between the PPG and DuPont properties.

The flow of groundwater in the vicinity of the Site is controlled by significant pumping by both PPG and DuPont. The groundwater pumping effectively controls the migration of the 1,4-dioxane between PPG and DuPont, causing it to flow directly to PPG's groundwater recovery wells RW-2 and RW-3 on the DuPont property and to DuPont's non-potable water production wells.

The area of the 1,4-dioxane plume containing concentrations exceeding the OEPA 35 ug/l clean-up goal continues to diminish with time. As a result, fewer properties have 1,4-dioxane concentrations exceeding the 35 ug/l clean-up goal since submittal of the first Five-Year Review work plan and draft report. The properties where 1,4-dioxane is currently present in groundwater at concentrations exceeding the 35 ug/l clean-up goal includes Trimold LLC, Night Owl Trucking, Don Goodchild, and Pewamo Ltd. (see Figure 2). All of these properties are commercial, industrial or undeveloped. None of these property owners use the groundwater for potable purposes.

The Earnhart Hill Water District (EHWD) supplies drinking water to the local area. The EHWD's production well field is located to the north of the DuPont property.

2.2.2 Summary of Remedial Actions

In accordance with the 1989 AOC between OEPA and PPG, the objectives of the remedial actions consisted of the following:

1. Implement a remedial action to address environmental contamination at the PPG Circleville, OH Site consistent with the requirements of applicable federal, state, and local law;
2. Monitor the effectiveness of the selected remedial action and thereafter to make appropriate changes if or when necessary to attain the desired effectiveness; and
3. Perform additional soil, groundwater, and surface water sampling and analysis to better define the extent and chemical characteristics of contamination.

The RD/RA WP (MFG, 2000) for the Site was written and approved based on the remedial requirements presented in the DD (OEPA, June 2000). The DD required remedial measures for soil in the Buried Pond Residue Area (PSA-2) and for the Off-Property Groundwater (Figure 3). The remedial actions were primarily intended to address the potential unacceptable risks to the hypothetical construction worker in PSA-2 and the hypothetical use of the off-property groundwater as a drinking water source. The following subsections provide a summary of the selected remedial actions for each of these areas.

2.2.2.1 Buried Pond Residue Area (PSA-2)

PSA-2 is located on the southeast portion of the Site (Figure 3). The area measures approximately 140 feet by 380 feet and was used for the disposal of residues excavated from the former infiltration ponds (PSA-1) in 1973. The residue is currently covered with soil and the surface is vegetated. A fence surrounds the entire PPG plant, which prevents access by the public to PSA-2.

Constituents of concern in soil at PSA-2 include PCB aroclor 1248 and VOCs (ethylbenzene, toluene, and xylene). The FS and the DD remedial actions for PSA-2 included institutional controls, engineering controls, and long term monitoring as summarized below.

PSA-2 Institutional Controls

Institutional controls are administratively and/or legally enforceable measures that reduce or eliminate potential exposure to contaminated Site media. OEPA requires that the institutional and engineering controls be effective, maintained, and subject to periodic evaluations consideration of current property uses and future building plans. The institutional controls required for PSA-2 include the following:

- **Restrictive Covenants:** A restrictive covenant to the deed is required to ensure that future land use in the area of PSA-2 remains industrial. In addition, a pre-development soil sampling program is required to confirm soil contaminant levels prior to any future development of the PSA-2 area. The covenant must also require that all property transfer occurs only with advance notice to OEPA. The covenant for PSA-2 was recorded with the Pickaway County Recorder in July 2007.
- **Signs:** PPG has posted four signs, one per side, around the perimeter of PSA-2 that state “Soil Excavation or other intrusive activities are strictly prohibited in this area without a signed work permit from the EHS Department.” The PPG EHS Department is responsible for ensuring that no intrusive work or development of PSA-2 is occurring without proper protection of Site workers.

- **Training:** Public and employee training programs are required to inform the community, contractors, and employees of PSA-2 issues. PPG expanded its training program to include the issues at PSA-2 for both employees and contractors. Employee training consists of a health and safety orientation program to train new and existing employees requiring access to the PSA-2 Area on the potential hazards present. Contractor training consists of a mandatory safety orientation program and is required at least once annually. The training includes Site access procedures, work permits, Site hazards, Site emergency procedures, as well as other safety topics.

PSA-2 Engineering Controls

Engineering controls are physical measures or barriers that contain or control exposure to contaminants. Security measures (e.g., fences) are required to prevent access by the public to PSA-2 and vegetation and soil cover are required to be maintained to prevent exposure to PSA-2 soil contaminants. The engineering controls for PSA-2 include a security fence, which is present around the perimeter of the Site to prevent public access. The fence is and will continue to be inspected and repaired on a regular basis by PPG. The second engineering control for PSA-2 is soil cover with vegetation, which is maintained by PPG. The cover prevents direct contact and/or erosion of the contaminants. PPG inspects the area quarterly and seeds and removes trees as necessary.

PSA-2 Long Term Monitoring

The effectiveness of remedial action at PSA-2 is assessed via a long-term monitoring program relative to performance standards for as long as the contaminant concentrations in soil prohibit unrestricted land use. The monitoring is recorded and reported to OEPA. The long-term monitoring program includes the following:

- **Groundwater monitoring:** Groundwater downgradient of PSA-2 is monitored by sampling wells whose locations are provided in Figure 3 to ensure that the concentrations of constituents in groundwater from PSA-2 do not exceed MCLs or risk-based clean-up levels. The Long-Term Groundwater Monitoring Plan (LTGWMP; MFG, 2002) specifies the procedures and analytical methods necessary to monitor groundwater. Samples are analyzed for 1,4-dioxane and VOCs. PPG submits a semiannual groundwater monitoring report to OEPA with results of all sampling and analyses.
- **Soil Monitoring:** Soil monitoring is only necessary in the event that future development of PSA-2 occurs, in which case PPG will submit a Site Development Plan including a Soil Sampling Plan prior to any development activities. Future land owners are also required by Deed Restriction to submit a Site Development Plan in the event of future development.

- **Institutional Controls Monitoring:** Routine audits of training records, inspection of the Site, and ongoing documentation of land use will occur. Monitoring requirements related to institutional controls include the following:
 - Review and documentation of any changes or updates to the education program status applicable to PSA-2;
 - Documentation of all personnel receiving training;
 - Review and documentation of any changes in PSA-2 development status; and
 - Review and documentation of any changes to the status of the industrial land use restrictions.

Engineering Controls Monitoring: Site security fence, sign, and soil and vegetative cover inspections are routinely conducted and documented to ensure public access is effectively prohibited. Any necessary maintenance, identified during the inspection, is performed. Inspections are documented and quarterly Site remediation status reports are sent to OEPA.

2.2.2.2 Off-Property Groundwater Contaminants

In the FS and DD, the selected remedial action for the off-property groundwater contaminants included institutional controls, engineering controls, groundwater extraction, and long-term monitoring. The following subsections provide the detail of these remedial measures.

Groundwater Institutional Controls

The institutional controls included restrictive covenants/equitable servitudes in the form of deed restrictions, training to inform Site employees, contractors and the community of the presence of the groundwater plume, and notifications to the existing and future off-Site landowners regarding the presence of 1,4-dioxane in the groundwater and requirements that the groundwater not be used for potable purposes.

- **Groundwater Restrictive Covenants/Equitable Servitudes and Notifications:** PPG has in place legal agreements (restrictive covenants and equitable servitudes) with neighboring property owners for off-Site properties where 1,4-dioxane currently exceeds 35 µg/l, with the exception of the Don Goodchild property. However, PPG has always been granted access to this property and anticipates access will continue to be provided. PPG mails annual notifications to the neighboring property owners to remind them of the requirement for non-potable use of groundwater, the requirement not to alter the plume dimensions through groundwater pumping, and the requirement for proper disposal of pumped groundwater. PPG ensures compliance through written or verbal verification. Notifications will continue annually throughout the life of the off-Site groundwater plume monitoring program.
- **Groundwater Training:** PPG has included discussion of on-Site groundwater issues in training programs for employees and contractors whose work would entail contacting groundwater due to construction activities that would require excavations of greater than 10 feet. The employee and contractor training programs are similar to that for PSA-2. PPG

also participates on the Community Advisory Panel (CAP) to make the community aware of off-property groundwater issues. PPG has completed annual CAP presentations to inform the community regarding the clean-up status of the off-Site plume and restrictions on groundwater usage. The CAP also serves as an open forum for discussion between Pickaway County representatives and the PPG Circleville company officials.

Engineering Controls

The engineering control for off-Site groundwater contaminants is containment and extraction by means of pumping in the DuPont well field. PPG and DuPont have a 20-year agreement whereby PPG is allowed access to the DuPont pumping wells to sample and record cumulative flow rates, as needed, to evaluate containment of the plume. In the event that containment is lost, the agreement provides for PPG to take corrective action.

DuPont's average well field pumping rate fell between 1994 and 1999 due to the decommissioning of several of DuPont's production lines. In December of 2001, a detection of 1,4-dioxane occurred in DuPont monitoring well MW-10 at the northern boundary of the DuPont property. Subsequently, PPG installed two groundwater recovery wells (RW-2 and RW-3) on DuPont property in order to ensure cut off and capture of the plume. The pumping wells, which are each designed to operate at approximately 750 gallons per minute, discharge to the Scioto River via a National Pollution Elimination Discharge System (NPDES) Permit No. 4IN00194001.

Groundwater – Long Term Monitoring

Long-term groundwater monitoring is being conducted, and will continue for five years after the 1,4-dioxane concentrations are less than the 35 µg/l cleanup level. Sampling will continue on a semiannual basis and the samples analyzed for 1,4-dioxane and/or VOCs. Monitoring includes the following:

- On- and Off-Property Groundwater Monitoring: Groundwater levels and groundwater sampling occurs on a semiannual basis in accordance with the OEPA approved revised monitoring plan (OEPA, 2008). The groundwater levels are measured in all Site monitoring wells during both semi-annual events. Samples are collected during the first semi-annual event each year from 12 monitoring wells and five groundwater production wells. During the second semi-annual event, five monitoring and one Production well are sampled (See Figure 3). DuPont production well P-6 was included in the revised plan for sampling. However, it is damaged and indefinitely out of service, and therefore cannot be sampled. The sampling results are reported to the OEPA on semiannual basis.

- Surface Water Monitoring: In accordance with the annual surface water sampling requirement of the LTGWMP, three surface water samples are collected from the Scioto River for 1,4-dioxane analysis. Samples are collected annually from the Scioto River upstream, at, and downstream of DuPont Outfall 001.
- Groundwater Institutional Controls Monitoring: PPG conducts routine audits of training records and inspection of neighboring properties with regard to groundwater use.
- Off-Property Groundwater Engineering Controls Monitoring: PPG receives monthly pumping rate information from DuPont groundwater production wells. The rates are analyzed relative to plume containment and groundwater simulations and any recommendations for changes in pumping are calculated and recorded to assess plume capture. These records are maintained by PPG and reported in the semiannual report.

3.0 FIVE-YEAR REVIEW SCOPE OF WORK

The purpose of the Five-Year Review is to confirm that the selected remedial measures are effective and that the original clean-up values as well as the overall remedial action(s) remain protective of human health and the environment.

The Five-Year Review consists of three main tasks:

- Review of site-related documents pertaining to Remedial Action Objectives (RAOs), remedial design and implementation and remedial system performance;
- Incorporating public participation into the review process; and
- Conducting an on-site inspection and technology evaluation of the selected remedies.

Each of the main tasks is comprised of multiple activities as described below. The results of the Five-Year Review process will be summarized in a Five-Year Review Report, which will be provided to the OEPA and made available to the general public and other interested parties for review and comment.

3.1 Document Review

Initially, a listing of the documents pertaining to the Site remedial program will be prepared, and the documents collected. Relevant documents will be reviewed from which to base an assessment of remedial performance at the Site.

3.1.1 Background Documents

- Administrative Order on Consent – This document stated the mutual objectives of OEPA and PPG Industries, Inc., which were stated in Section 2.2.2. The AOC will be reviewed in the 5-year review to ensure that the remedial effort is consistent with the requirements of the AOC.
- Remedial Investigation Report – This document summarized the nature and extent of Site-related constituents and presented the risk assessment. These documents contained a comprehensive report of the Phase I RI, the Phase II RI, a groundwater model, a quantitative human health and ecological risk assessment, and a site conceptual model. Constituents of concern included 1,4-dioxane, VOCs, and PCBs. With the exception of 1,4-dioxane in groundwater, the occurrence of significant concentrations of these constituents remained localized around the areas where they were deposited and/or released. The RI Report also concluded that the Phase II groundwater investigation was consistent with the site conceptual model. The shallow groundwater plume on

the Site included VOCs that remain localized around specific PSAs. 1,4-Dioxane was detected in the intermediate aquifer, and sporadically in the deep aquifer. The major constituent in off-Site groundwater is 1,4-dioxane, and the rate and pathway of groundwater migration is controlled by significant pumping by PPG and DuPont. The RI findings will be reviewed in the five-year review to determine if they are still relevant and protective of human health and the environment.

- Risk Assessment Summary – The risk assessment was integrated into the RI document and provided a quantitative analysis of the potential for adverse effects to human health and the environment that may be associated with the constituents identified at the Site. It included an analysis of the Site conditions in the absence of remedial action in order to provide an understanding of the pathways of potential exposure, and the risks of adverse human health and ecological effects. The risk assessment was conducted using standard USEPA methodologies and assumptions. Potential human health risks were determined to be within acceptable limits for all PSAs under the then-current exposure conditions. In addition, potential ecological impacts were determined to be negligible or non-existent. The assessment further concluded that under certain hypothetical exposure scenarios, PSA-2 and off-property groundwater could pose unacceptable human health risks; however, none of these hypothetical exposure scenarios were complete at the time of the assessment. This assessment, its methods, toxicological information, the health standards utilized, and the conclusions it drew will be reviewed to determine if the risk assessment assumptions are still valid.
- Feasibility Study (FS) Summary – The purpose of the FS was to develop and evaluate the remedial alternatives for the Site. The FS was prepared in accordance with Task 8a of OEPA's Generic Statement of Work, Remedial Investigation/Feasibility Study, State Version appended to the AOC and Section 4.5.1 of the approved Phase II RI Work Plan. The FS addressed potential risks associated with the hypothetical future exposure to PSA-2 subsurface soil and off-property groundwater for the Site. The FS summarized the RI report and provided brief descriptions relative to Site background, Site description, PSAs, groundwater quality, the risk assessment, and the conceptual site model. It described potential Applicable or Relevant and Appropriate Requirements (ARARs), developed Remedial Action Objectives, identified and screened potential applicable remedial technologies, assembled appropriate remedial alternatives from the surviving technologies, and evaluated the assembled alternatives.

Based on their ability to achieve the RAOs and their subsequent evaluation an Institutional Controls alternative was recommended for both PSA-2 and off-Site groundwater. The FS will be reviewed during the five-year review to determine if new technologies are available and/or if the selected alternative continues to be the most feasible, and protective of human health and the environment.

- OEPA Decision Document – The DD presents the OEPA's selected remedial action for the Site. The major components of the selected remedial actions are:
 - **Buried Pond Residue Area (PSA-2):** which includes institutional and engineering controls and long-term monitoring;

- **Off-Property Groundwater Contaminants:** which includes institutional and engineering controls, groundwater extraction, and long-term monitoring controls.

It was determined that these selected remedial actions were protective of human health and the environment, met applicable State requirements, and were the most cost effective methods available. The remediation will be reviewed in the context of the requirements of the DD to verify compliance.

- Remedial Design/Remedial Action (RD/RA) Work Plan – The scope of the RD/RA WP was based on remedial requirements presented in the DD for the Site. It presented a summary and schedule of the tasks and subtasks PPG implemented to fulfill the remedial action requirements and the reports and reviews that are and will be submitted according to the requirements. The RD/RA WP will be reviewed during the five-year review to determine if PPG has maintained consistent fulfillment of the required remedial actions.

Draft First Five-Year Review Report – The purpose of the first five-year review was to determine if the selected and implemented remedies at the Site continue to be protective of human health and the environment. The review also included a remedial technology review to assess whether any new or emerging technologies may be applicable and feasible for the Site related constituents. The draft First-Year Review Report concluded that the current remedy is both effective and protective. The report will be reviewed to determine if new technologies are available and/or if the selected alternative continues to be the most feasible and protective of human health and the environment.

3.1.2 Remedial Design Review

No formal design was necessary for the implementation of the remedial measures at the Site. Therefore, there are no design documents and no design review will be conducted.

3.1.3 Maintenance and Monitoring

The effectiveness of the remedial actions at the Site are assessed via a long-term monitoring program as described in Section 2.2.2. The Five-Year Review will include a review of the current monitoring program to determine its effectiveness and to determine if changes (additions or deletions) to the program are warranted. Additionally, the effectiveness of the remedial action for the off-property groundwater plume will be evaluated through review of the groundwater monitoring data. Trends in the groundwater concentrations will be evaluated via trend analyses such as linear regression analyses of the data through time.

3.2 Standards Review

The 5-year review will contain a brief review of the standards selected for the Site. The standards review will consist of a review of the Site-specific performance standards presented in the DD, and a review of the risk assessment, potential exposure pathways and toxicology of the constituents present to ensure that the selected standards remain protective of human health and the environment. The specific work to be performed in the standards review is presented in the following sections.

3.2.1 Specific Performance Standards Required by Decision Document

Performance standards are the applicable standards and criteria for the remedial design/remedial action and operation and maintenance of the remedial activities. The following specific performance standards apply to the Site:

Performance Standards for Soil Alternative 2, Institutional Controls with Monitoring: A performance monitoring and evaluation program was established at PSA-2, which included:

- Institutional and engineering controls that are effective, maintained, and include periodic evaluations of current property uses and future building plans. They must achieve:
 - 1) Legal restriction for industrial use of the PPG property;
 - 2) Fences, security, education programs, cover soil, and vegetation maintenance; and
 - 3) A means to detect and correct violations within 90 days.
- No impacts to groundwater occurring above USEPA MCLs or risk-based cleanup levels if no MCL exists. Compliance will be documented through the long-term groundwater monitoring program. Constituent concentrations exceeding cleanup levels at the edge of PSA-2 will require re-evaluation of the selected remedial alternative.
- Continuous monitoring and evaluations for as long as the soil contamination remains in place. No restrictions are necessary when risk-based clean-up goals are met for unrestricted use of soil. All monitoring, evaluation activities, notification, and appropriate work plans are required should future development be considered for PSA-2.

Performance standards for GW Alternative 2, Institutional Controls, Existing Extraction, and Monitoring: A performance monitoring and evaluation program was established and implemented to ensure the following:

- Institutional and engineering controls that are effective, maintained, and include an evaluation of compliance, property ownership, property uses, and development plans. This includes periodic evaluations of the pumping agreement with DuPont to ensure appropriate production rates are maintained and monitoring of contaminant concentrations. Institutional and engineering controls achieve performance standards if:
 - 1) There remains a legal prohibition against groundwater use for potable purposes;
 - 2) Owners and/or users of properties impacted by groundwater containing 1,4-dioxane concentrations exceeding 35 ug/l are made aware, at least annually, of the usage restrictions; and
 - 3) A means to detect and correct violations within 90 days.
- Future industrial groundwater users do not alter current plume dimensions. The plume is defined by concentrations that exceed risk-based cleanup standards and all current and future land owners are notified about the groundwater contamination and plume restrictions. Technical assistance and groundwater modeling are required.
- A long-term groundwater monitoring program has been established that includes groundwater monitoring wells located within the highest concentrations of the plume, at the edges of the plume, and outside the plume and that is used to:
 - 1) Confirm the fate and transport model of residual soil contamination at PSA-2
 - 2) Assess contamination within the shallow, intermediate, and deep groundwater zones both on- and off-property
 - 3) Assess the results of the RI groundwater modeling
 - 4) Determine the current exposure pathways remain unchanged
 - 5) Determine the horizontal and vertical extent of contamination to below detection limit values
 - 6) A long-term surface water monitoring program that will monitor water quality of discharge and the downstream reach of the Scioto River for 1,4-dioxane to determine concentrations being discharged and transferred to the river. Action by PPG is necessary if DuPont's NPDES discharge limits for 1,4-dioxane are exceeded. Surface water monitoring will continue until no further action is required for the off-property plume.
 - 7) Appropriate steps will be taken to prevent exposures to human health or the environment should the long-term monitoring program indicate significant changes from the site conceptual model of the RI report.

Compliance with the performance standards is documented through routine reporting and five-year reviews. The five-year review will provide a summary and discussion evaluating the effectiveness of the chosen remedial actions and their performance. Under this review, performance standard compliance will be evaluated against collected monitoring information to ensure that the selected remedial action meets the objectives originally laid out and continues to

be protective of human health and the environment. Information to be evaluated includes concentration trends, pumping scenarios, production well efficiency, groundwater modeling, fate and transport of contaminants, potential pathways of exposure, and groundwater flow direction and gradient.

3.2.2 Risk Assessment

This risk assessment generally followed standard and customary practices within federal risk assessment guidelines for the performance of risk assessment under CERCLA (USEPA, 1988a, 1989a, 1991a, 1991b, 1991c). The scientific basis and validity of the values incorporated into the assessment were considered and discussed in the context of primary research literature and provided a framework of reference for the conclusions that were made.

In this risk assessment, for soil, Region III risk-based concentrations (USEPA Region III, 1994) were used as extremely conservative comparison criteria for the detected chemicals. No risk-based criteria were available for a few chemicals detected on the Site. Surrogate criteria were applied to these chemicals based on structural similarity to other chemicals, as is the accepted procedure.

The USEPA (1989a) requires that the 95th percentile upper confidence limit on the arithmetic mean be used as the representative concentration for risk assessment dose calculations, which was used in this risk assessment. In addition, USEPA guidance (1992a) also recommends the assumption that environmental sampling data are lognormally distributed and this assumption was made for all data collected at Circleville. All USEPA recommended equations (1992b) were also used to calculate the 95% UCLs in this risk assessment.

The dose-response portion of this assessment also utilized the USEPA acceptable techniques and available information to set acceptable levels of human exposure. The majority of existing knowledge about the dose-response relationship is based on data collected from studies of animals, studies of human occupational exposures, and theories about how humans respond to environmental doses of chemicals. These USEPA-derived risk criteria address sub-chronic and chronic non-carcinogenic health effects and potential carcinogenic health risks. EPA's Integrated Risk Information System (IRIS) was the primary source in this risk assessment for these values and the secondary source was EPA's Health Effects Assessment Summary Tables (HEAST). A non-carcinogenic reference dose for aroclor 1248 was derived from a primary research study because there is no USEPA-derived criterion.

In the five-year review, the standards, toxicological information, health risk-based levels, and risk assessment assumptions will be reviewed to determine if the methods and values used continue to be valid.

3.2.3 Changing Standards

A review of applicable cleanup standards for remedial actions will be conducted to determine if the selected standards remain valid. This will include, but not be limited to, a review of the exposure assumptions and toxicity data, a review of the RAOs, and a review of applicable cleanup levels for soil and groundwater.

3.3 Interviews

As part of the community involvement process, interviews will be conducted to obtain input regarding current Site conditions or Site concerns, and concerns of neighboring property owners. Those targeted for interviews include neighboring property owners, selected PPG personnel, the Manager of the Earnhart Hill Water District and the Pickaway County Health Department. In addition, if local citizens respond to the public notice of the review and express an interest in being interviewed, they will also be included in the interview process.

Potential interviewees include, but are not limited to the following:

- Those that can provide background information about the Site: For example persons that can provide information such as enforcement of institutional controls, changes in land use, trespassing, or unusual activity at the site, etc. (including stakeholders, nearest neighbors and property owners, and groundwater use agreement entities). These include:
 - Night Owl
 - Trimold
 - Pewamo, Ltd.
 - Marathon Oil / Pilot
 - Don Goodchild
 - Earnhart Hill
 - DuPont
- State and local officials:
 - Ohio EPA
 - Pickaway County Health Department

- Performance, operation and maintenance personnel:
 - O&M contractors
 - PPG Facility Environmental Manager

The interviews will include the following information:

- Date of the Interview
- Name
- Title
- Affiliation
- Location of the interview
- Summary of discussion
- Discussion of any problems addressed
- Successes with the implementation of remedial action
- Suggestions for future references

A copy of the interview form is included in “Five-Year Review Inspection Checklist” in Appendix A.

3.4 Onsite Inspection

As part of the Five-Year Review process, a Site inspection will be conducted by OEPA within nine months of the expected signature date of the review. The review will be performed without bias or preconceived views or conclusions about the remedy and Site conditions. The inspection will provide information regarding the Site remediation status and to visually confirm and document conditions of the remedy, the Site in general, and the surrounding area. The “Five-Year Review Inspection Checklist” in Appendix A can be used as a guide for planning and documenting the inspection for containment and groundwater remedies.

3.5 Technology Review

The five-year review will determine whether the remedy at the Site is, or upon completion will be, protective of human health and the environment. This technical assessment will examine the following three key questions when determining the protectiveness of the remedy:

1. **Question A** – Is the remedy functioning as intended by the decision documents?
2. **Question B** – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

3. **Question C** – Has any other information come to light that could call into question the protectiveness of the remedy?

The “Comprehensive Five-Year Review Guidance,” (USEPA, June 2001), will be utilized to answer the above questions for the evaluation of the remedial actions occurring at the site.

3.6 Review of Institutional/Engineering Controls

The institutional and engineering controls for the Site will be evaluated for effectiveness through review of the training records, inspection of the fences, signs, etc., evaluation of the monitoring data and through the interview process. The five-year review report will include a summary of the evaluation as well as any recommendations or necessary changes to the institutional or engineering controls.

3.7 Public Participation

Public participation in the Five-Year Review process will consist of the following:

- Providing a notice of review to the general public
- Conducting interviews with site stakeholders (nearby residents, state and local administrators, and onsite workers)
- Updating the Public Repository with the results of the Five-Year Review process.

These activities will be conducted to ensure that community involvement includes all interested parties and stakeholders. The public notices for conducting the five-year review will be initiated and recorded by the OEPA. The public notifications will be documented in the Five-Year Review Report. The following subsection provides the requirements of the public notification for the five-year review.

3.7.1 Public Notification of Review

Public notification of the Five-Year Review process will include:

- Advance notice of when the Five-Year Review will be conducted,
- Notice of when the review has been completed, and
- Providing the results of the review to a local document repository.

The notifications will be made in the legal section of the local newspaper. The advance notice will occur six months prior to the formal review. The notice to the community will include the following:

- Site name and location
- Lead agency (OEPA) conducting the review
- Brief description of the selected remedy
- Invitation to the community to provide input to the review process
- Contact name and phone number
- Scheduled completion date for the Five-Year review.

The notice of Five-Year Review completion will occur within one month of completion of the review. This notice will include:

- Site name and location
- Lead agency (OEPA) conducting the review
- Brief description of the selected remedy
- A summary of contamination addressed by the remedy to date
- A brief summary of the results of the Five-Year Review
- The evaluation results of the protectiveness of the remedy and any recommendations or follow-up actions required
- Locations where a copy of the Five-Year review Report can be obtained or viewed
- Contact name and phone number
- The anticipated date of the next Five-Year Review.

3.8 Five-Year Review Report

After completion of document reviews, stakeholder interviews, public participation activities, the site inspection, and technology review, all generated data will be compiled and evaluated. A Five-Year Review Report will be prepared based upon the results of this evaluation. The report will present the findings and conclusion of the review including recommendations, follow-up actions, and protectiveness determinations.

The report will be made available to the community for comment. Any comments from the general public, local government, or other interested parties will be attached to the report as part of the final record.

An outline of the Five-Year Review Report is as follows (OEPA, August 1999):

1. Background
 - 1.1 Introduction
 - 1.2 Remedial Objectives
 - 1.3 Review of Applicable Laws and Regulations
2. Site Conditions
 - 2.1 Summary of Site Visit
 - 2.2 Areas of Noncompliance
3. Risk Assessment
4. Recommendations
 - 4.1 Technology Recommendations
 - 4.2 Statement on Protectiveness
 - 4.3 Timing and Scope of Next Review
 - 4.4 Implementation Requirements

4.0 ESTABLISHMENT OF REVIEW TEAM

For the PPG Circleville, Ohio site, the Five-Year Review team will consist of personnel from OEPA, PPG, and the remedial contractor project manager. The review team will include personnel who collectively provide expertise regarding regulatory, administrative, technical, and remedial effectiveness.

Mr. Douglas Crandall, OEPA Project Manager will provide regulatory and administrative input regarding the project.

Mr. Brian McGuire, PPG Project Manager will provide information regarding remedial activities, current status and future plans.

Mr. Joseph Pohlman, PPG Environmental Engineer located at the Circleville Plant, will provide applicable information related to the implementation of the portions of the remedy managed by the plant.

Mr. Mark Portman, Tetra Tech Program Manager will provide technical input for the Five-Year Review team. Mr. Portman has been involved in remedial activities regarding the site since 1992. Mr. Portman will be able to provide input regarding remedial effectiveness, attainment of cleanup goals, and potential data gaps regarding the site.

Assisting the review team, as required, will be technical experts who will provide input regarding legal, regulatory, engineering, risk assessment, and hydrogeology issues. The technical experts will be consulted on an as-needed basis to adequately review the protectiveness of the remedy.

5.0 SCHEDULE

Figure 4 provides the schedule for conducting the Five-Year Review. This Work Plan is scheduled for completion approximately eight months prior to completion of the five-year review. Document review activities will be undertaken immediately after finalization of this Five-Year Review Work Plan. Review activities will follow the schedule timeline in Figure 4, which shows latest submittal dates for each event. However, where possible, activities may be completed ahead the proposed schedule. The review will be completed two months prior to report completion. Public participation activities and the technical effectiveness evaluation will be initiated six months prior to report deadline submittal and will be completed one month prior to report submittal. The site inspection will commence four months prior to report submittal and will be completed approximately two months prior to report finalization.

6.0 REFERENCES

Comprehensive Five-Year Review Guidance, (OSWER No. 9355.7-038-P), US Environmental Protection Agency, June 2001.

Director's Final Findings and Orders for the Site, Ohio Environmental Protection Agency, 1989.

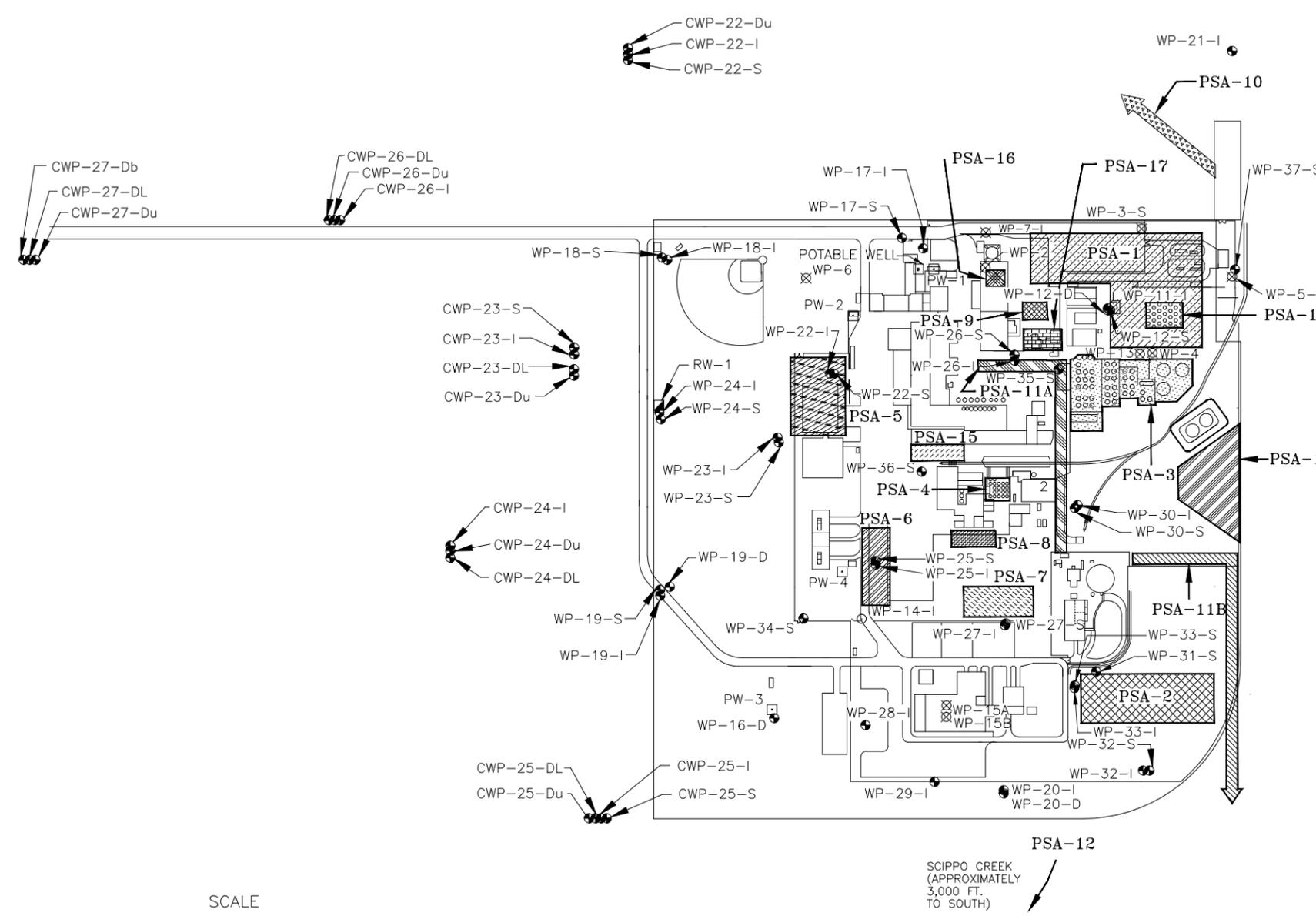
MFG, Inc., 2006. Five-Year Review Work Plan, PPG Industries, Inc. Circleville, Ohio, Ohio EPA Master Sites ID #165-0641. April 20.

OEPA, 2008. Letter from Doug Crandall Site Coordinator at OEPA to Brian McGuire of PPG, RE: Proposed Modifications to the Long-Term Groundwater Monitoring Plan, PPG Industries Circleville, Ohio Facility. October 28.

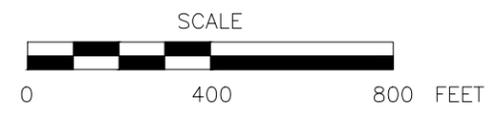
OEPA, 2006. Letter from Doug Crandall Site Coordinator at OEPA to Brian McGuire of PPG, RE: Draft Five-Year Review Work Plan for PPG Circleville (165-000641). March 23.

Tetra Tech MM, Inc., 2007. Draft First Year Five-Year Review Report, PPG Coatings and Resins Facility Circleville, Ohio, Site-Wide Operable Unit Ohio EPA Master Sites ID #165-0641. April 20.

SAS G:\AutoCAD\rcs\PPG Circleville\120403 PPG Circleville 05 Year Review FIGURE 1 PSA's.dwg 03-03-2005 03:03 pm
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 Plot time: [None]
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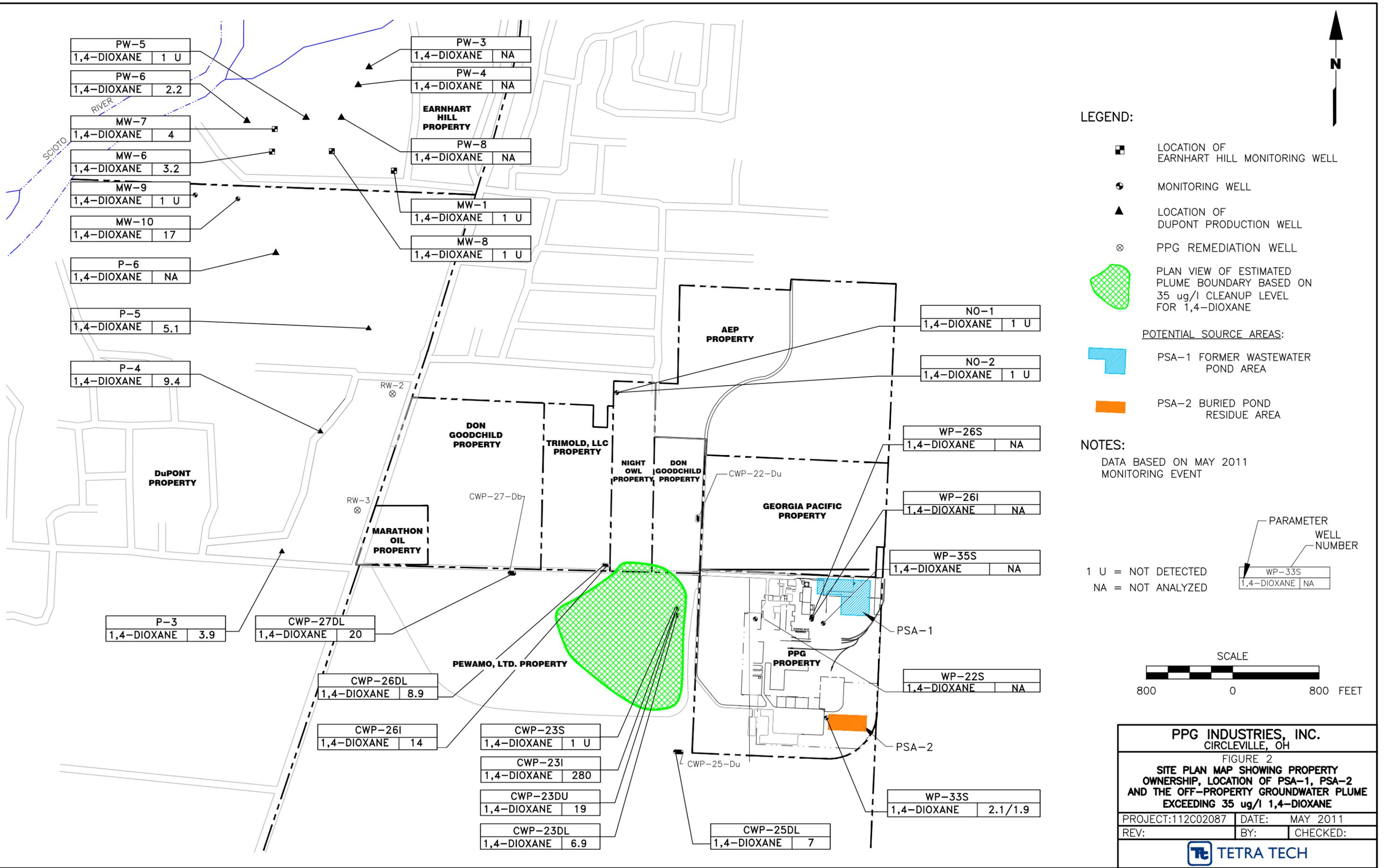


- LEGEND**
- MONITORING WELL
 - RECOVERY WELL
 - PRODUCTION WELL
- PSA-1 FORMER WASTEWATER POND AREA
 - PSA-2 BURIED WASTEWATER POND RESIDUE
 - PSA-3 BUILDING NO. 1 TANK FARM
 - PSA-4 BUILDING NO. 2 TANK FARM
 - PSA-5 FORMER CONTRACTOR AREA
 - PSA-6 WEST PAD DRUM STORAGE
 - PSA-7 SOUTH PAD DRUM STORAGE
 - PSA-8 BUILDING NO. 2 DRAINAGE DITCH
 - PSA-9 FORMER LIQUID WASTE INCINERATOR
 - PSA-10 PIPELINE TO SCIOTO RIVER
 - PSA-11A EAST YARD/ SOUTH STORM SEWER AREA
 - PSA-11B INACTIVE STORM SEWER SYSTEM
 - PSA-12 SCIPIO CREEK (SOUTH OF PPG)
 - PSA-13 METEOROLOGICAL STATION AREA
 - PSA-14 SOIL STOCKPILE AREA
 - PSA-15 FORMER OIL UNLOADING AREA
 - PSA-16 TEST RESIN DISPOSAL AREA
 - PSA-17 SOLVENT MANAGEMENT TANKS



PSA-12
 SCIPIO CREEK
 (APPROXIMATELY
 3,000 FT.
 TO SOUTH)

PPG INDUSTRIES, INC. CIRCLEVILLE, OH		
FIGURE 1		
SITE LAYOUT AND POTENTIAL SOURCE AREAS		
PROJECT:1120C02087	DATE:	APRIL 2006
REV:	BY:	CHECKED:
TETRA TECH		



PW-5	1,4-DIOXANE	1 U
------	-------------	-----

PW-6	1,4-DIOXANE	2.2
------	-------------	-----

MW-7	1,4-DIOXANE	4
------	-------------	---

MW-6	1,4-DIOXANE	3.2
------	-------------	-----

MW-9	1,4-DIOXANE	1 U
------	-------------	-----

MW-10	1,4-DIOXANE	17
-------	-------------	----

P-6	1,4-DIOXANE	NA
-----	-------------	----

P-5	1,4-DIOXANE	5.1
-----	-------------	-----

P-4	1,4-DIOXANE	9.4
-----	-------------	-----

PW-3	1,4-DIOXANE	NA
------	-------------	----

PW-4	1,4-DIOXANE	NA
------	-------------	----

PW-8	1,4-DIOXANE	NA
------	-------------	----

MW-1	1,4-DIOXANE	1 U
------	-------------	-----

MW-8	1,4-DIOXANE	1 U
------	-------------	-----

NO-1	1,4-DIOXANE	1 U
------	-------------	-----

NO-2	1,4-DIOXANE	1 U
------	-------------	-----

WP-26S	1,4-DIOXANE	NA
--------	-------------	----

WP-26I	1,4-DIOXANE	NA
--------	-------------	----

WP-35S	1,4-DIOXANE	NA
--------	-------------	----

P-3	1,4-DIOXANE	3.9
-----	-------------	-----

CWP-27DL	1,4-DIOXANE	20
----------	-------------	----

CWP-26DL	1,4-DIOXANE	8.9
----------	-------------	-----

CWP-26I	1,4-DIOXANE	14
---------	-------------	----

CWP-23S	1,4-DIOXANE	1 U
---------	-------------	-----

CWP-23I	1,4-DIOXANE	280
---------	-------------	-----

CWP-23DU	1,4-DIOXANE	19
----------	-------------	----

CWP-23DL	1,4-DIOXANE	6.9
----------	-------------	-----

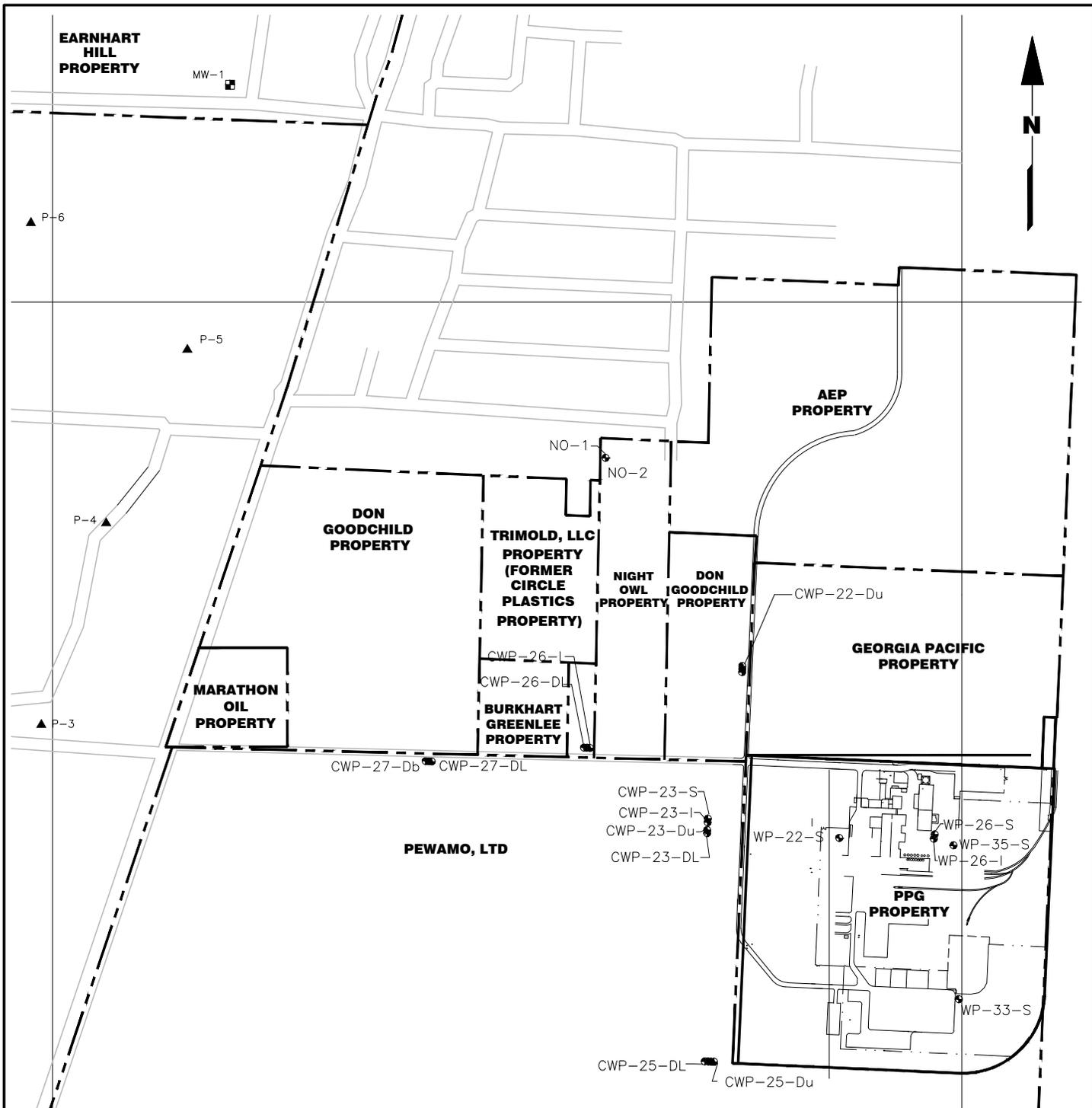
CWP-25DL	1,4-DIOXANE	7
----------	-------------	---

WP-22S	1,4-DIOXANE	NA
--------	-------------	----

WP-33S	1,4-DIOXANE	2.1/1.9
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WP-33S	1,4-DIOXANE	NA
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SAS: G:\AutoCAD\mes\PPG Circleville\120403 PPG Circleville\5 Year Review\FIGURE 4 MONITORING WELL LOCATIONS.dwg 03-03-2005 03:03 pm
 Xrefs: [none]
 Images: [none]
 Plot time: 04-18-2006
 Plot date:



LEGEND:

- LOCATION OF EARNHART HILL MONITORING WELL
- MONITORING WELL
- ▲ LOCATION OF DUPONT PRODUCTION WELL

NOTE: DUPONT P-6 IS INOPERABLE AND CANNOT BE SAMPLED

SCALE



800 0 800 FEET

PPG INDUSTRIES, INC. CIRCLEVILLE, OH		
FIGURE 3		
LOCATION OF MONITORING WELLS		
PROJECT:1120C02087	DATE:	JANUARY 2006
REV:	BY:	CHECKED:
TETRA TECH		

Appendix A

Five-Year Review Site Inspection Checklist

Five-Year Review Site Inspection Checklist

Purpose of the Checklist

The site inspection checklist provides a useful method for collecting important information during the site inspection portion of the five-year review. The checklist serves as a reminder of what information should be gathered and provides the means of checking off information obtained and reviewed, or information not available or applicable. The checklist is divided into sections as follows:

- I. Site Information
- II. Interviews
- III. On-site Documents & Records Verified
- IV. O&M Costs
- V. Access and Institutional Controls
- VI. General Site Conditions
- VII. Landfill Covers
- VIII. Vertical Barrier Walls
- IX. Groundwater/Surface Water Remedies
- X. Other Remedies
- XI. Overall Observations

Some data and information identified in the checklist may or may not be available at the site depending on how the site is managed. Sampling results, costs, and maintenance reports may be kept on site or may be kept in the offices of the contractor or at State offices. In cases where the information is not kept at the site, the item should not be checked as "not applicable," but rather it should be obtained from the office or agency where it is maintained. If this is known in advance, it may be possible to obtain the information before the site inspection.

This checklist was developed by EPA and the U.S. Army Corps of Engineers (USACE). It focuses on the two most common types of remedies that are subject to five-year reviews: landfill covers, and groundwater pump and treat remedies. Sections of the checklist are also provided for some other remedies. The sections on general site conditions would be applicable to a wider variety of remedies. The checklist should be modified to suit your needs when inspecting other types of remedies, as appropriate.

The checklist may be completed and attached to the Five-Year Review report to document site status. Please note that the checklist is not meant to be completely definitive or restrictive; additional information may be supplemented if the reviewer deems necessary. Also note that actual site conditions should be documented with photographs whenever possible.

Using the Checklist for Types of Remedies

The checklist has sections designed to capture information concerning the main types of remedies which are found at sites requiring five-year reviews. These remedies are landfill covers (Section VII of the checklist) and groundwater and surface water remedies (Section IX of the checklist). The primary elements and appurtenances for these remedies are listed in sections which can be checked off as the facility is inspected. The opportunity is also provided to note site conditions, write comments on the facilities, and attach any additional pertinent information. If a site includes remedies beyond these, such as soil vapor extraction or soil landfarming, the information should be gathered in a similar manner and attached to the checklist.

Considering Operation and Maintenance Costs

Unexpectedly widely varying or unexpectedly high O&M costs may be early indicators of remedy problems. For this reason, it is important to obtain a record of the original O&M cost estimate and of annual O&M costs during the years for which costs incurred are available. Section IV of the checklist provides a place for documenting annual costs and for commenting on unanticipated or unusually high O&M costs. A more detailed categorization of costs may be attached to the checklist if available. Examples of categories of O&M costs are listed below.

Operating Labor - This includes all wages, salaries, training, overhead, and fringe benefits associated with the labor needed for operation of the facilities and equipment associated with the remedial actions.

Maintenance Equipment and Materials - This includes the costs for equipment, parts, and other materials required to perform routine maintenance of facilities and equipment associated with a remedial action.

Maintenance Labor - This includes the costs for labor required to perform routine maintenance of facilities and for equipment associated with a remedial action.

Auxiliary Materials and Energy - This includes items such as chemicals and utilities which can include electricity, telephone, natural gas, water, and fuel. Auxiliary materials include other expendable materials such as chemicals used during plant operations.

Purchased Services - This includes items such as sampling costs, laboratory fees, and other professional services for which the need can be predicted.

Administrative Costs - This includes all costs associated with administration of O&M not included under other categories, such as labor overhead.

Insurance, Taxes and Licenses - This includes items such as liability and sudden and accidental insurance, real estate taxes on purchased land or right-of-way, licensing fees for certain technologies, and permit renewal and reporting costs.

Other Costs - This includes all other items which do not fit into any of the above categories.

OSWER No. 9355.7-03B-P

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Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name:	Date of inspection:
Location and Region:	EPA ID:
Agency, office, or company leading the five-year review:	Weather/temperature:
Remedy Includes: (Check all that apply) Landfill cover/containment Monitored natural attenuation Access controls Groundwater containment Institutional controls Vertical barrier walls Groundwater pump and treatment Surface water collection and treatment Other _____ _____	
Attachments: Inspection team roster attached	Site map attached
II. INTERVIEWS (Check all that apply)	
1. O&M site manager _____	
Name _____ Title _____ Date _____ Interviewed at site at office by phone Phone no. _____ Problems, suggestions; Report attached _____ _____	
2. O&M staff _____	
Name _____ Title _____ Date _____ Interviewed at site at office by phone Phone no. _____ Problems, suggestions; Report attached _____ _____	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents O&M manual As-built drawings Maintenance logs Remarks _____	Readily available Readily available Readily available	Up to date Up to date Up to date	N/A N/A N/A
2.	Site-Specific Health and Safety Plan Contingency plan/emergency response plan Remarks _____	Readily available Readily available	Up to date Up to date	N/A N/A
3.	O&M and OSHA Training Records Remarks _____	Readily available	Up to date	N/A
4.	Permits and Service Agreements Air discharge permit Effluent discharge Waste disposal, POTW Other permits _____ Remarks _____	Readily available Readily available Readily available Readily available	Up to date Up to date Up to date Up to date	N/A N/A N/A N/A
5.	Gas Generation Records Remarks _____	Readily available	Up to date	N/A
6.	Settlement Monument Records Remarks _____	Readily available	Up to date	N/A
7.	Groundwater Monitoring Records Remarks _____	Readily available	Up to date	N/A
8.	Leachate Extraction Records Remarks _____	Readily available	Up to date	N/A
9.	Discharge Compliance Records Air Water (effluent) Remarks _____	Readily available Readily available	Up to date Up to date	N/A N/A
10.	Daily Access/Security Logs Remarks _____	Readily available	Up to date	N/A

IV. O&M COSTS

1. **O&M Organization**
 State in-house Contractor for State
 PRP in-house Contractor for PRP
 Federal Facility in-house Contractor for Federal Facility
 Other _____

2. **O&M Cost Records**
 Readily available Up to date
 Funding mechanism/agreement in place
 Original O&M cost estimate _____ Breakdown attached

Total annual cost by year for review period if available

From _____	To _____	_____	Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	Breakdown attached
Date	Date	Total cost	

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS Applicable N/A

A. Fencing

1. **Fencing damaged** Location shown on site map Gates secured N/A
 Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A
 Remarks _____

C. Institutional Controls (ICs)

1. Implementation and enforcement				
Site conditions imply ICs not properly implemented	Yes	No	N/A	
Site conditions imply ICs not being fully enforced	Yes	No	N/A	
Type of monitoring (e.g., self-reporting, drive by)	_____			
Frequency	_____			
Responsible party/agency	_____			
Contact	_____			
	Name	Title	Date	Phone no.
Reporting is up-to-date	Yes	No	N/A	
Reports are verified by the lead agency	Yes	No	N/A	
Specific requirements in deed or decision documents have been met	Yes	No	N/A	
Violations have been reported	Yes	No	N/A	
Other problems or suggestions:	Report attached			

2. Adequacy	ICs are adequate	ICs are inadequate	N/A	
Remarks	_____			

D. General

1. Vandalism/trespassing	Location shown on site map	No vandalism evident		
Remarks	_____			

2. Land use changes on site	N/A			
Remarks	_____			

3. Land use changes off site	N/A			
Remarks	_____			

VI. GENERAL SITE CONDITIONS

A. Roads	Applicable	N/A		
1. Roads damaged	Location shown on site map	Roads adequate	N/A	
Remarks	_____			

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS Applicable N/A**A. Landfill Surface**

1. **Settlement (Low spots)** Location shown on site map Settlement not evident
 Areal extent _____ Depth _____
 Remarks _____

2. **Cracks** Location shown on site map Cracking not evident
 Lengths _____ Widths _____ Depths _____
 Remarks _____

3. **Erosion** Location shown on site map Erosion not evident
 Areal extent _____ Depth _____
 Remarks _____

4. **Holes** Location shown on site map Holes not evident
 Areal extent _____ Depth _____
 Remarks _____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
 Trees/Shrubs (indicate size and locations on a diagram)
 Remarks _____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
 Remarks _____

7. **Bulges** Location shown on site map Bulges not evident
 Areal extent _____ Height _____
 Remarks _____

8.	Wet Areas/Water Damage	Wet areas/water damage not evident	
	Wet areas	Location shown on site map	Areal extent _____
	Ponding	Location shown on site map	Areal extent _____
	Seeps	Location shown on site map	Areal extent _____
	Soft subgrade	Location shown on site map	Areal extent _____
	Remarks _____		
9.	Slope Instability	Slides	Location shown on site map No evidence of slope instability
	Areal extent _____		
	Remarks _____		
B. Benches Applicable N/A			
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	Flows Bypass Bench	Location shown on site map	N/A or okay
	Remarks _____		
2.	Bench Breached	Location shown on site map	N/A or okay
	Remarks _____		
3.	Bench Overtopped	Location shown on site map	N/A or okay
	Remarks _____		
C. Letdown Channels Applicable N/A			
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)			
1.	Settlement	Location shown on site map	No evidence of settlement
	Areal extent _____	Depth _____	
	Remarks _____		
2.	Material Degradation	Location shown on site map	No evidence of degradation
	Material type _____	Areal extent _____	
	Remarks _____		
3.	Erosion	Location shown on site map	No evidence of erosion
	Areal extent _____	Depth _____	
	Remarks _____		

4.	Undercutting Areal extent _____ Remarks _____	Location shown on site map Depth _____	No evidence of undercutting
5.	Obstructions Type _____ Location shown on site map Size _____ Remarks _____		No obstructions Areal extent _____
6.	Excessive Vegetative Growth No evidence of excessive growth Vegetation in channels does not obstruct flow Location shown on site map Remarks _____	Type _____	Areal extent _____
D. Cover Penetrations Applicable N/A			
1.	Gas Vents Properly secured/locked Evidence of leakage at penetration N/A Remarks _____	Active Functioning	Passive Routinely sampled Good condition Needs Maintenance
2.	Gas Monitoring Probes Properly secured/locked Evidence of leakage at penetration Remarks _____	Functioning	Routinely sampled Good condition Needs Maintenance N/A
3.	Monitoring Wells (within surface area of landfill) Properly secured/locked Evidence of leakage at penetration Remarks _____	Functioning	Routinely sampled Good condition Needs Maintenance N/A
4.	Leachate Extraction Wells Properly secured/locked Evidence of leakage at penetration Remarks _____	Functioning	Routinely sampled Good condition Needs Maintenance N/A
5.	Settlement Monuments Remarks _____	Located	Routinely surveyed N/A

E. Gas Collection and Treatment		Applicable	N/A
1.	Gas Treatment Facilities Flaring Good condition Remarks _____	Thermal destruction Needs Maintenance	Collection for reuse
2.	Gas Collection Wells, Manifolds and Piping Good condition Remarks _____	Needs Maintenance	
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) Good condition Remarks _____	Needs Maintenance	N/A
F. Cover Drainage Layer		Applicable	N/A
1.	Outlet Pipes Inspected Remarks _____	Functioning	N/A
2.	Outlet Rock Inspected Remarks _____	Functioning	N/A
G. Detention/Sedimentation Ponds		Applicable	N/A
1.	Siltation Areal extent _____ Siltation not evident Remarks _____	Depth _____	N/A
2.	Erosion Areal extent _____ Erosion not evident Remarks _____	Depth _____	
3.	Outlet Works Remarks _____	Functioning	N/A
4.	Dam Remarks _____	Functioning	N/A

H. Retaining Walls		Applicable	N/A
1.	Deformations Horizontal displacement _____ Rotational displacement _____ Remarks _____	Location shown on site map	Deformation not evident Vertical displacement _____
2.	Degradation Remarks _____	Location shown on site map	Degradation not evident
I. Perimeter Ditches/Off-Site Discharge		Applicable	N/A
1.	Siltation Areal extent _____ Remarks _____	Location shown on site map	Siltation not evident Depth _____
2.	Vegetative Growth Vegetation does not impede flow Areal extent _____ Remarks _____	Location shown on site map	N/A Type _____
3.	Erosion Areal extent _____ Remarks _____	Location shown on site map	Erosion not evident Depth _____
4.	Discharge Structure Remarks _____	Functioning	N/A
VIII. VERTICAL BARRIER WALLS		Applicable	N/A
1.	Settlement Areal extent _____ Remarks _____	Location shown on site map	Settlement not evident Depth _____
2.	Performance Monitoring Performance not monitored Frequency _____ Head differential _____ Remarks _____	Type of monitoring _____	Evidence of breaching

IX. GROUNDWATER/SURFACE WATER REMEDIES		Applicable	N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines		Applicable	N/A
1.	Pumps, Wellhead Plumbing, and Electrical Good condition All required wells properly operating Remarks _____ _____	Needs Maintenance	N/A
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances Good condition Needs Maintenance Remarks _____ _____		
3.	Spare Parts and Equipment Readily available Good condition Remarks _____ _____	Requires upgrade	Needs to be provided
B. Surface Water Collection Structures, Pumps, and Pipelines		Applicable	N/A
1.	Collection Structures, Pumps, and Electrical Good condition Needs Maintenance Remarks _____ _____		
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances Good condition Needs Maintenance Remarks _____ _____		
3.	Spare Parts and Equipment Readily available Good condition Remarks _____ _____	Requires upgrade	Needs to be provided

C. Treatment System	Applicable	N/A
1. Treatment Train (Check components that apply) Metals removal Air stripping Filters Additive (e.g., chelation agent, flocculent) Others Good condition Sampling ports properly marked and functional Sampling/maintenance log displayed and up to date Equipment properly identified Quantity of groundwater treated annually Quantity of surface water treated annually Remarks	Oil/water separation Carbon adsorbers Needs Maintenance	Bioremediation
2. Electrical Enclosures and Panels (properly rated and functional) N/A Remarks	Good condition	Needs Maintenance
3. Tanks, Vaults, Storage Vessels N/A Remarks	Good condition	Proper secondary containment Needs Maintenance
4. Discharge Structure and Appurtenances N/A Remarks	Good condition	Needs Maintenance
5. Treatment Building(s) N/A Chemicals and equipment properly stored Remarks	Good condition (esp. roof and doorways)	Needs repair
6. Monitoring Wells (pump and treatment remedy) Properly secured/locked All required wells located Remarks	Functioning Needs Maintenance	Routinely sampled Good condition N/A
D. Monitoring Data		
1. Monitoring Data Is routinely submitted on time	Is of acceptable quality	
2. Monitoring data suggests: Groundwater plume is effectively contained	Contaminant concentrations are declining	

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
