# QUALITY ASSURANCE PROJECT PLAN

## *PPG Oak Creek*

## *Former Tank Farm Area Statement of Basis*

**Revision 0**

**August 2016**

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## *List of Acronyms & Abbreviations*

| | |
|---|---|
| CB&I | CB&I Environmental & Infrastructure, Inc. |
| CLP | Contract Laboratory Program |
| COC | chain-of-custody |
| IDL | instrument detection limit |
| LCS | laboratory control sample |
| MDL | method detection limit |
| MS/MSD | matrix spike/matrix spike duplicate |
| PACE | PACE Analytical Services, Inc. |
| PPG | PPG Industries, Inc. |
| PQL | practical quantitation limit |
| QAPjP | Quality Assurance Project Plan |
| QC | quality control |
| RCRA | Resource Conservation Recovery Act |
| RFI | RCRA Facility Investigation |
| RPD | relative percent difference |
| Shaw | Shaw Environmental & Infrastructure, Inc. |
| SOP | Standard Operating Procedure |
| SWMU | solid waste management unit |
| TAL | Target Analyte List |
| TFA | Tank Farm Area |
| USEPA | U.S. Environmental Protection Agency |
| UST | underground storage tank |
| VOC | volatile organic compound |
| WDNR | Wisconsin Department of Natural Resources |

## 1.0 Approval Signature Page

**Title:** Quality Assurance Project Plan, PPG Oak Creek, Former Tank Farm Statement of Basis.

Jody Overmyer
PPG Project Manager

8/22/2016
Date Reviewed

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Date: 2016.08.22 07:47:21 -05'00'

Zachary Sasnow
USEPA Project Manager

8/22/2016
Date Reviewed

Scott Furlong
CB&I Project Manager

8/22/16
Date Reviewed

Richard McCracken
CB&I Project Chemist

8/22/16
Date Reviewed

## 2.0 *Quality Assurance Project Plan Distribution List*

Copies of the Quality Assurance Project Plan (QAPjP) will be distributed to each individual listed below. Revisions to the QAPjP will be likewise distributed, to include the revision number and date in the footer. Older versions of the QAPjP should be destroyed when a newer revision is received.

| | | |
|---|---|---|
| PPG Industries, Inc. (PPG) | | |
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| Michael Thompson, PPG Oak Creek plant contact | mikethompson@ppg.com | (414) 764-6000 |
| U.S. Environmental Protection Agency (USEPA) | | |
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## 3.0 *Problem Definition*

Details of the problem definition are provided in the PPG Oak Creek Facility Groundwater Monitoring Work Plan Statement of Basis (Work Plan), previously submitted to and approved by USEPA.

## 4.0 *Task Description*

Details of the task to be accomplished are provided in the Work Plan.

## 5.0 Project Organization

The project organization is shown on Figure A-1. Project responsibilities are as follows:

PPG Project Manager: The PPG Project Manager is responsible for all aspects of the project, including budget, schedule, contractor oversight, and agency communications.

CB&I Project Manager: The CB&I Project Manager oversees the activities of all CB&I personnel, ensures compliance with the Work Plan, assigns duties to project staff, evaluates training needs for the project staff, and provides budget and schedule control.

USEPA Project Manager: The USEPA Project Manager reviews and approves project plans and reports, including the Work Plan and the QAPjP, for both completeness and technical adequacy. He provides consultation regarding the execution and completion of the planned sampling efforts. He coordinates directly with other USEPA and PPG staff (as needed) to ensure that project goals are met.

CB&I Project Technical Lead: The CB&I Project Technical Lead is the primary point of contact for project activities. He oversees generation, distribution, and compliance with the Work Plan and controls project consistency. Additional responsibilities include oversight of all field activities and report generation, ensuring that project deliverables are reviewed for accuracy and completeness before release, and ensuring that QAPjP requirements are satisfied.

CB&I Project Chemist: The CB&I Project Chemist will generate the QAPjP, transmit the QAPjP to the field staff and laboratory, work with the PACE Account Executive to schedule bottle and sample shipments, identify and resolve analytical issues, assist in identifying and resolving sample collection issues, and review/validate all data based on data quality indicators.

CB&I Field Team Lead: The CB&I Field Team Lead is responsible for implementing the field aspects of the Work Plan and QAPjP, including preparation for field activities, sample collection, and documentation. He works directly with the Project Technical Lead to ensure sample collection, documentation, packaging, and shipping are performed using the procedures specified in the QAPjP.

PACE Account Executive: The PACE Account Executive is the primary point of contact between CB&I and PACE. He coordinates sample receipt, processing, analysis, and data reporting with members of the laboratory technical staff.

# 6.0 Quality Objectives and Criteria

## 6.1 Data Quality Objectives

### *State the Problem*

PPG is in the process of preparing a Draft Statement of Basis for the former Tank Farm Area (TFA) of the Oak Creek facility. The Statement of Basis will explain historical interim corrective actions performed at the former TFA as well as propose future actions for groundwater at the former TFA. Before finalizing the Statement of Basis, the USEPA requested that a groundwater sampling event be performed to define the current groundwater flow conditions and groundwater quality status. USEPA will ultimately issue the Statement of Basis.

### *Identify the Goal of the Study*

The goals of this study are to collect sufficient groundwater elevation and analytical data to define current conditions at the former TFA.

### *Identify Informational Inputs*

Water levels will be measured using an electronic water level indicator, to the nearest 0.01 foot.

The most recent groundwater sampling at the former TFA included analyses for benzene, toluene, ethylbenzene, and xylene only. The last groundwater samples that included a more comprehensive analytical suite were collected in 2001. A more representative picture of the current groundwater conditions is needed prior to preparation of the Statement of Basis. Therefore, groundwater contaminants of concern for this sampling event will include the 51 volatile organics on the Target Analyte List (TAL) from Contract Laboratory Program (CLP) Statement of Work SOM02.3, the six phthalates on the TAL, and the eight Resource Conservation Recovery Act (RCRA) metals.

Groundwater samples will be collected using low-flow techniques, as detailed in the Sampling Methods section of this QAPjP. The samples will be analyzed using SW846 methods, as detailed in the Analytical Methods section of this QAPjP.

The Corrective Measures Implementation Report (Shaw Environmental & Infrastructure, Inc. [Shaw], 2006) established the following Target Cleanup Goals for groundwater at the former TFA:

| Constituent | Cleanup Goal (milligrams per liter) |
|---|---|
| Benzene | 0.005 |
| Ethylbenzene | 0.7 |

| Constituent | Cleanup Goal (milligrams per liter) |
|---|---|
| Toluene | 1.0 |
| Xylene | 10.0 |
| Styrene | 0.1 |
| Methylene chloride | 0.005 |
| 1,1,2,2-Tetrachloroethane | 0.0005 |
| Tetrachloroethene | 0.005 |

*Define the Boundaries of the Study*

Groundwater samples must be collected at the former TFA that are representative of current site conditions. Therefore, samples will be collected from monitoring wells that are upgradient, on site, and downgradient of the former TFA at the locations shown on Figure 1 of the Work Plan. The subsequent analytical results will provide a picture of current former TFA conditions, but can be compared with historical data to determine possible concentration trends.

*Develop the Analytical Approach*

If the analytical data are consistent with historical results, USEPA will proceed with preparation of the Statement of Basis. The Statement of Basis will document the success of the remedy completed for the former TFA and will assist with determining what additional actions, if any, are required for the facility.

*Specify Performance or Acceptance Criteria*

Overall precision and accuracy Data Quality Indicators (detailed below) have been established for this project based on the laboratory's previous experience and on analytical method guidance. Laboratory data will be reviewed on an ongoing basis. All data reported by the laboratory will undergo an internal review process by the analyst, a peer or supervisor review, and a project management review before undergoing data validation.

*Develop the Plan for Obtaining Data*

The Work Plan plus later sections of this QAPjP provide details as to which former TFA monitoring wells will be sampled, sample collection methods, and the analyses to be performed.

## *6.2 Data Quality Indicators*

The following indicators will be used to judge data quality, with the goal for each indicator as shown.

*Precision*

Precision refers to the reproducibility of measurements and is defined as the measurement of mutual agreement among individual measurements of the same property, usually under "prescribed similar conditions." Precision is expressed in terms of the relative percent difference (RPD) between duplicate determinations. Field duplicates will have an RPD goal of ≤ 50%, while laboratory duplicates will have a goal of ≤ 25%.

*Accuracy*

Accuracy is a measure of the bias in a system or the degree of agreement of a measurement against an accepted reference or true value. It is typically expressed as a percent recovery. Analytical accuracy will be assessed through the analysis of spikes including surrogates, matrix spike/matrix spike duplicates (MS/MSDs), laboratory control samples (LCS), and calibration check samples with the goal of all recoveries falling with historical laboratory acceptance ranges.

*Representativeness*

Representativeness is a qualitative parameter that expresses the degree to which sample data actually represent the matrix conditions. Requirements and procedures for sample collection and handling have been designed to maximize sample representativeness.

*Completeness*

Data completeness represents the percentage of valid data collected from a sampling/analytical program or measurement system compared to the amount expected to be obtained under optimal conditions. The completeness goals are > 95% for sample collection and > 90% for valid sample data.

*Comparability*

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability for sampling and analysis tasks will be achieved by:

- Specifying well-recognized techniques and accepted standard methods for sampling and analysis using well-trained sampling and analysis technicians to execute the prescribed methods consistently
- Requiring that all involved sampling and analysis personnel produce adequate documentation to record how the prescribed methods were actually executed, noting nonconformances and corrective measures taken

*Sensitivity*

Sensitivity is a qualitative parameter that addresses the ability of the instrumentation to differentiate between varying responses. Sensitivity is important as it affects the ability to detect the target analytes at the levels of interest so that project-specific goals are met. Sensitivity is achieved by establishing various limits, including instrument detection limits (IDLs), method detection limits (MDLs), and practical quantitation limits (PQLs). Both IDLs and MDLs are based on interference-free matrices which do not take into account the matrix effects of environmental samples. PQLs are the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

# *7.0 Special Training/Certification*

No special training or certifications are required for the former TFA groundwater sampling and analysis.

# *8.0 Documentation and Records*

Work Plan Distribution: The Work Plan for the groundwater sampling at PPG's former Oak Creek TFA will be distributed by CB&I's Technical Lead. The distribution list for the Work Plan is detailed above. Revisions to the Work Plan will likewise be distributed by CB&I's Project Technical Lead.

Field Records: Well development and well purging/sampling information will be recorded on appropriate log sheets. The log sheets will be compiled by the field team lead and shipped to the project manager for use and eventual storage in the central files.

Laboratory Records: Analytical data will be reported using PACE's standard reporting package format. The data will also be provided electronically, in a format to be agreed upon by CB&I and PACE data managers. The analytical data will be validated, compiled, interpreted, and reported and eventually stored in the CB&I central files.

# *9.0 Sampling Process Design*

The Work Plan details the design for the former TFA data collection effort.

## 10.0 Sampling Methods

Groundwater samples will be collected using low-flow methods as detailed in attached Standard Operating Procedure (SOP) EI-FS111 (see Appendix A for SOPs). Note that the SOP was developed by Shaw and was last revised in 2011. CB&I purchased Shaw in 2013. The SOPs are in the process of being converted to CB&I documents but are valid for use prior to the completion of the conversion process. Appendix B contains field documentation forms that will be completed during site activities.

## 11.0 Sample Handling and Custody

Sample documentation, custody, and shipping will be performed in accordance with the following SOPs (which are attached):

| Standard Operating Procedure | Title |
|---|---|
| EI-FS001 | Field Logbook |
| EI-FS003 | Chain of Custody Documentation - Paper |
| EI-FS012 | Shipping and Packaging of Non Hazardous Samples |

*Sample Containers and Holding Times*

| Parameter | Container | Preservative | Holding time (days) | | |
|---|---|---|---|---|---|
| | | | Collection to extraction | Extraction to analysis | Collection to analysis |
| Volatile organic compounds (VOCs) | 3 x 40 ml vials with Teflon™-lined septum cap | HCl to pH < 2, cool 4 $^{o}$C | NA | NA | 14 |
| Phthalates | 2 x 1 liter amber glass | Cool 4 $^{o}$C | 7 | 40 | NA |
| Metals except mercury | 1 x 1 liter plastic | $HNO_3$ to pH <2 | NA | NA | 180 |
| Mercury | 1 x 1 liter plastic | $HNO_3$ to pH <2 | NA | NA | 28 |

# 12.0 Analytical Methods

Former TFA groundwater samples will be analyzed for the 51 CLP TAL VOCs, the six phthalates on the CLP TAL, and the eight RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). PACE will perform the sample analyses in their Green Bay, Wisconsin, laboratory. PACE has developed SOPs for each analysis, based on the following USEPA SW846 analytical methods:

- Volatile Organics: Method 8260B
- Phthalates: Method 8270C
- Metals (except mercury): Method 6010B
- Mercury: Method 7470A

MDLs and PQLs for each parameter are shown on Tables A-1 through A-3. Uncontrolled copies of the SOPs are available for review upon request.

# 13.0 Quality Control

## 13.1 Field Quality Control Samples

Field quality control (QC) samples will be collected at the following frequency:

| QC Sample | Frequency | Criteria |
|---|---|---|
| Trip blank | 1 per cooler containing VOC aliquots | < reporting limit |
| Equipment blank | 1 per 20 samples | < reporting limit |
| Field duplicate | 1 per 10 samples | RPD < 50% |
| MS/MSD | 1 per 20 samples | Historical lab criteria |

Equipment blanks will be collected by pumping analyte-free water through the sample tubing and collecting it in the sample bottles, then analyzed for the same parameters as the field samples.

## 13.2 Laboratory Quality Control Samples

The PACE analytical SOPs used for former TFA groundwater analyses are based on the SW846 analytical method, which include the following routine QC samples at the frequency shown:

*Methods 8260 and 8270*

| QC Sample | Frequency | Criteria |
|---|---|---|
| Method blank | 1 per prep batch | < reporting limit |
| LCS | 1 per prep batch | Within historical limits, see Tables A-1 and A-2 |
| MS/MSD | 1 per prep batch | Within historical limits, see Tables A-1 and A-2 |
| Internal standards | All field & QC samples | Retention time ± 30 seconds of ICAL midpoint; response of -50% to +100% of ICAL midpoint. |
| Surrogate spikes | All field & QC samples | Within method defined limits, see Tables A-1 and A-2 |

*Methods 6010 and 7471*

| QC Sample | Frequency | Criteria |
|---|---|---|
| Calibration blank | 1 per 10 samples, plus beginning and end of run | < reporting limit |
| Method blank | 1 per prep batch | < reporting limit |
| LCS | 1 per prep batch | Within historical limits, see Table A-3 |
| MS/MSD | 1 per prep batch | Within historical limits, see Table A-3 |
| Interference check (ICS-A, ICS-AB) | Beginning of run, every 12 hours | ICS AB ± 20% of true |
| Serial dilution | 1 per prep batch | 5x dilution with ± 10% for analytes > 50x IDL |

# *14.0 Instrument Testing, Inspection, and Maintenance*

Field: Various groundwater indicator parameters will be monitored during low-flow purging of the monitoring wells, including dissolved oxygen, oxidation-reduction potential, specific conductance, pH, temperature, and turbidity. The instrumentation used to monitor for these parameters will rented from a commercial vendor. CB&I will request the most recent calibration records for each instrument to verify that each instrument has been maintained and calibrated per manufacturer specifications.

Laboratory:  PACE has developed an SOP that addresses preventative, routine, and non-routine maintenance.  The SOP defines the types and frequencies of maintenance for each piece of analytical instrumentation, as well as the required documentation.  An uncontrolled copy of the SOP is available upon request.

## *15.0 Instrument Calibration and Frequency*

Field:  The pH meter will be calibrated at the beginning of each day.  The other indicator parameter instrumentation will be checked at the beginning of each day to determine if it is working properly.  If not reading properly, the instrumentation will be calibrated (if possible) or replaced (if not possible).  Field calibration logs will be maintained by the Field Team Lead for inclusion in the site files.

Laboratory:  Each of the analytical SOPs used for groundwater analysis specifies the frequency of initial and ongoing calibrations, as well as the criteria that must be met by the calibration.  The methods also specify corrective actions to be taken when calibrations fail and when recalibration is required.  An uncontrolled copy of the analytical SOPs is available upon request.

## *16.0 Inspection of Supplies and Consumables*

There are no critical supplies or consumables that require inspection during the former TFA groundwater sampling project.

## *17.0 Non-Direct Measurements*

The PPG Oak Creek facility is subject to the regulations promulgated under RCRA.  On March 31, 1992, the USEPA issued a RCRA permit to the Oak Creek facility.  This permit contained a requirement for conducting a RCRA Facility Investigation (RFI) at 10 solid waste management units (SWMUs).  With USEPA's approval of the RFI Report, corrective action requirements were met for 8 of the 10 SWMUs.  The 2 remaining SWMUs represent the former TFA and were the focus of a presumptive remedy implementation.

The former TFA was also subject to federal and state regulations regarding underground storage tanks (USTs). In order to meet the UST regulations, PPG elected to take the USTs out of service and either remove or close them in place. This work was completed in the spring of 1999. The facility RCRA permit was closed on June 30, 2004.

Numerous investigations were performed at the facility between 1981 and 1997, a summary of which can be found in the 1997 RFI Report (ICF Kaiser Engineers, Inc., 1997). Subsequently, PPG voluntarily monitored groundwater quality semiannually from 2004 through September 2011. The groundwater monitoring program was temporarily discontinued after the September 2011 sampling event, pending approval of the Statement of Basis. All of the investigations and groundwater sampling events were performed following USEPA-approved work plans using USEPA analytical methods. The data generated during these events will be used as the historical basis for comparison with the former TFA data generated during the present investigation.

# *18.0 Data Management*

Field: Field logbooks, well development, and well purge/sample logs will be used to document observations, sampling information, and other pertinent information during groundwater sampling. They are considered legal documents and will be returned to the project office and maintained as part of the project file.

Chain-of-custody (COC) forms are used to document the sample custody process from collection through shipment to receipt at the laboratory. The field copy of the form will also be returned to the project office and maintained as part of the project file. In addition, the analytical data package will contain a copy of the COC showing receipt by the laboratory.

Laboratory: Laboratory reports will be received from PACE in electronic format. In addition, the analytical data will also be received as an Electronic Data Deliverable. Both deliverables will be stored at the CB&I project office on a local server, with daily backup, from which it will be available to project staff for use and analysis.

Reports: The field and laboratory data will be used to generate tables and figures for the final report. In addition, the data may be used to determine human and ecological risk, characterize concentration trends, and perform a comparison with cleanup criteria. The data used to generate tables and figures and perform data comparisons will be accessed from the local server. The output of such data massage will likewise be stored on the local server. Project personnel may download the data to their computer for use but should save their work daily to the server so that appropriate backup precautions can be implemented. Draft and final versions of the report will be stored on a local CB&I server with daily backup.

Hard copy reports will be stored in the project files, under the control of the Project Manager and Project Technical Lead, who will distribute copies as appropriate.

## *19.0 Assessments and Response Actions*

Field: Field logbooks, well development, well purge/sample logs, and sample custody forms will be reviewed by the Project Technical Lead at the end of field operations to verify consistency with Work Plan requirements. Data discrepancies will be identified and promptly resolved with the Field Team Lead.

Laboratory: PACE is certified by the Wisconsin Department of Natural Resources (WDNR) to perform volatile organics, semivolatile organics, and metals analysis of non-potable water samples. The certification lasts for one year—from September 1, 2015 through August 31, 2016—and PACE is currently in the process of having the certification renewed for the next year. PACE was audited prior to their initial WDNR certification and has been audited every three years since. Their most recent audit was conducted in March 2015; a copy of the audit report is available upon request. In addition, all laboratories are required to complete proficiency testing analyses during their annual accreditation renewal process.

## *20.0 Reports to Management*

Results of the field record review will be verbally reported to the Project Manager once all issues have been resolved. The final project report will contain a section summarizing data quality information, including field data review, data validation results, and data usability. Corrective actions will be included in the report.

Laboratory audit and proficiency testing sample results are addressed by the PACE Quality Assurance Manager and Lab Manager as they become available.

# *21.0 Data Review, Verification, and Validation*

## *21.1 Data Review and Verification*

*Field Records:*

- COC forms and shipping documentation will be reviewed by the laboratory upon receipt of samples for verification that all planned samples have been received and the appropriate analysis has been requested. The COC form will be signed by all parties that had custody of samples, with the exception of commercial carriers.
- All field records, including COCs, field log books, and well purge forms will be reviewed by the Project Technical Lead and verified for completeness.

*Laboratory Analytical Data:*

- All laboratory data packages will be verified internally by PACE laboratory management for completeness and technical accuracy prior to submittal.
- All laboratory data packages will be verified by the Project Chemist for content upon receipt.
- A cross check of the electronic verses the hard copy data will be performed by the Project Chemist to verify consistency.

*Project Data:*

- Data validation qualifiers will be entered into the project database. The qualifiers will be verified by the Project Chemist prior to use by project staff.
- A data completeness summary will be prepared by the Project Technical Lead to verify that completeness goals have been met.

## *21.2 Data Validation*

CB&I will validate the laboratory analytical data packages by reviewing the QC summary information against method and historically developed laboratory criteria. Data qualifiers will be applied as detailed in the following methods (as they are applicable to SW846 analytical procedures):

- National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- National Functional Guidelines for Superfund Inorganic Methods Data Review, August 2014

# 22.0 Reconciliation with User Requirements

A review will be undertaken to determine whether Data Quality Objectives were met. Precision, accuracy, representativeness, comparability, completeness, and sensitivity parameters will be evaluated and compared with user requirements.

*Precision*

Overall sampling and analysis precision will be assessed by evaluating the field duplicate RPD. The MS/MSD RPD will be used to assess laboratory precision. RPD is defined as the difference between two measurements divided by their mean and expressed as a percent as shown:

$$RPD = (D1 - D2) / ((D1 + D2)/2) \times 100$$

where:

| | | |
|---|---|---|
| D1 | = | Result from the original determination |
| D2 | = | Result from a duplicate measurement |

*Accuracy*

Accuracy is a measure of the bias in a system, and is measured as the degree of agreement between a measurement, X, and an accepted reference or true value, T. It is typically expressed as a percent recovery, calculated as shown:

$$\text{Percent recovery} = (X - S)/T \times 100$$

where:

| | | |
|---|---|---|
| X | = | Experimentally determined concentration |
| S | = | Unspiked sample concentration |
| T | = | True concentration, equal to the spike added |

Analytical accuracy is assessed through the analysis of surrogate spikes, MS/MSD, and LCSs as well as audit samples and standard reference materials. Surrogates and MS/MSDs are spiked onto the actual sample matrix, thus taking into account the nature of the sample matrix as well as the native concentration of the spiked analyte.

*Representativeness*

Representativeness is a qualitative parameter that expresses the degree to which sample data represent the matrix conditions. Requirements and procedures for sample collection and handling are designed to maximize sample representativeness. Representativeness will be monitored by reviewing field documentation to verify that sampling SOPs were followed.

### *Completeness*

Data completeness represents the percentage of valid data collected from a sampling/analytical program system compared to the amount expected to be obtained under optimal conditions, and will be calculated as follows:

Collected sample completeness (%) = (Actual # of samples collected / Intended # of samples to be collected) * 100

Valid sample completeness (%) = (# of non-rejected analytes from all samples collected / total # of analytes from all samples collected) * 100

### *Comparability*

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability for sampling and analysis tasks is achieved by:

- Specifying standard methods for sampling and analysis
- Requiring adequate sampling and analysis documentation

Standard field and laboratory methods help ensure that the data generated for an event are comparable to past and future activities.

### *Sensitivity*

Sensitivity is achieved by establishing IDLs, MDLs, and PQLs. PQLs are the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The Project Chemist will review the analytical data to verify that PQLs have been achieved in support of project cleanup goals.

## *23.0 References*

ICF Kaiser Engineers, Inc., 1997. *RCRA Facility Investigation Report*, PPG Oak Creek Facility, Oak Creek, Wisconsin, July.

Shaw Environmental & Infrastructure, Inc., 2006. Corrective Measures Implementation Report, PPG Oak Creek Facility, Oak Creek, Wisconsin, March.

# Tables

# Table A-1
# PPG Oak Creek QAPjP
# VOC Detection Limits, LCS Criteria, MS/MSD Criteria, Surrogate Criteria

| Analyte | Method Detection Limit (ug/L) | Practical Quantitation Limit (ug/L) | LCS/LCSD | | | MS/MSD | | |
|---|---|---|---|---|---|---|---|---|
| | | | Lower Limit (%) | Upper Limit (%) | RPD | Lower Limit (%) | Upper Limit (%) | RPD |
| 1,1,1-Trichloroethane | 2.16 | 1.00 | 70 | 131 | 20 | 70 | 134 | 20 |
| 1,1,2,2-Tetrachloroethane | 2.21 | 1.00 | 67 | 130 | 20 | 67 | 130 | 20 |
| 1,1,2-Trichloroethane | 0.18 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| 1,1,2-Trichlorotrifluoroethane | 2.03 | 5.00 | 50 | 150 | 20 | 50 | 150 | 20 |
| 1,1-Dichloroethane | 0.41 | 1.00 | 70 | 133 | 20 | 70 | 134 | 20 |
| 1,1-Dichloroethene | 0.44 | 1.00 | 70 | 130 | 20 | 68 | 136 | 20 |
| 1,2,3-Trichlorobenzene | 0.50 | 5.00 | 70 | 130 | 20 | 62 | 138 | 20 |
| 1,2,4-Trichlorobenzene | 6.14 | 5.00 | 70 | 130 | 20 | 62 | 139 | 20 |
| 1,2-Dibromo-3-chloropropane | 0.50 | 5.00 | 50 | 150 | 20 | 50 | 150 | 20 |
| 1,2-Dibromoethane (EDB) | 0.17 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| 1,2-Dichlorobenzene | 0.20 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| 1,2-Dichloroethane | 11.97 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| 1,2-Dichloropropane | 0.50 | 4.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| 1,3-Dichlorobenzene | 0.50 | 1.00 | 70 | 130 | 20 | 70 | 131 | 20 |
| 1,4-Dichlorobenzene | 0.50 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| 2-Butanone (MEK) | 0.23 | 20.00 | 50 | 200 | 20 | 50 | 200 | 20 |
| 2-Hexanone | 1.94 | 5.00 | 50 | 150 | 20 | 50 | 150 | 20 |
| 4-Methyl-2-pentanone (MIBK) | 2.98 | 5.00 | 50 | 150 | 20 | 50 | 150 | 20 |
| Acetone | 0.43 | 20.00 | 33 | 200 | 23 | 33 | 200 | 23 |
| Benzene | 0.50 | 1.00 | 60 | 135 | 20 | 57 | 138 | 20 |
| Bromochloromethane | 2.31 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| Bromodichloromethane | 0.23 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| Bromoform | 2.43 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| Bromomethane | 0.21 | 5.00 | 33 | 130 | 27 | 33 | 130 | 27 |
| Carbon disulfide | 2.95 | 5.00 | 70 | 139 | 20 | 70 | 153 | 20 |
| Carbon tetrachloride | 1.99 | 1.00 | 70 | 138 | 20 | 70 | 138 | 20 |
| Chlorobenzene | 0.50 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| Chloroethane | 0.50 | 1.00 | 51 | 130 | 20 | 51 | 130 | 20 |
| Chloroform | 0.50 | 5.00 | 70 | 130 | 20 | 70 | 130 | 20 |

**Table A-1**
**PPG Oak Creek QAPjP**
**VOC Detection Limits, LCS Criteria, MS/MSD Criteria, Surrogate Criteria**

| Analyte | Method Detection Limit (ug/L) | Practical Quantitation Limit (ug/L) | LCS/LCSD | | | MS/MSD | | |
|---|---|---|---|---|---|---|---|---|
| | | | Lower Limit (%) | Upper Limit (%) | RPD | Lower Limit (%) | Upper Limit (%) | RPD |
| Chloromethane | 2.50 | 1.00 | 25 | 132 | 20 | 25 | 132 | 20 |
| cis-1,2-Dichloroethene | 0.50 | 1.00 | 69 | 130 | 20 | 61 | 140 | 20 |
| cis-1,3-Dichloropropene | 0.26 | 4.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| Cyclohexane | 2.33 | 5.00 | 50 | 150 | 20 | 50 | 150 | 20 |
| Dibromochloromethane | 0.50 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| Dichlorodifluoromethane | 2.22 | 1.00 | 23 | 130 | 20 | 23 | 130 | 20 |
| Ethylbenzene | 0.50 | 1.00 | 70 | 136 | 20 | 70 | 138 | 20 |
| Isopropylbenzene (Cumene) | 2.50 | 1.00 | 70 | 140 | 20 | 70 | 152 | 20 |
| m&p-Xylene | 0.50 | 2.00 | 70 | 138 | 20 | 70 | 140 | 20 |
| Methyl acetate | 86.20 | 10.00 | 50 | 150 | 20 | 44 | 150 | 21 |
| Methyl t-butyl ether | 0.50 | 1.00 | 66 | 138 | 20 | 66 | 139 | 20 |
| Methylcylohexane | 1.67 | 5.00 | 50 | 150 | 20 | 50 | 150 | 20 |
| Methylene Chloride | 0.18 | 4.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| o-Xylene | 0.24 | 1.00 | 70 | 134 | 20 | 70 | 134 | 20 |
| Styrene | 2.19 | 1.00 | 70 | 133 | 20 | 70 | 138 | 20 |
| Tetrachloroethene | 2.25 | 1.00 | 70 | 138 | 20 | 70 | 148 | 20 |
| Toluene | 1.50 | 1.00 | 70 | 130 | 20 | 70 | 130 | 20 |
| trans-1,2-Dichloroethene | 0.50 | 1.00 | 70 | 131 | 20 | 70 | 133 | 20 |
| trans-1,3-Dichloropropene | 0.26 | 4.00 | 69 | 130 | 20 | 69 | 130 | 20 |
| Trichloroethene | 0.81 | 1.00 | 70 | 130 | 20 | 70 | 131 | 20 |
| Trichlorofluoromethane | 0.33 | 1.00 | 50 | 150 | 20 | 50 | 150 | 20 |
| Vinyl chloride | 0.92 | 1.00 | 49 | 130 | 20 | 49 | 133 | 20 |

| Surrogate | Recovery Criteria | |
|---|---|---|
| | Lower Limit (%) | Upper Limit (%) |
| 4-Bromofluorobenzene | 70 | 130 |
| Dibromofluoromethane | 70 | 130 |
| Toluene-d8 | 70 | 130 |

# Table A-2
# PPG Oak Creek QAPjP
# Phthalate Detection Limits, LCS Criteria, MS/MSD Criteria, Surrogate Criteria

| Analyte | Method Detection Limit (ug/L) | Practical Quantitation Limit (ug/L) | LCS/LCSD | | | MS/MSD | | |
|---|---|---|---|---|---|---|---|---|
| | | | Lower Limit (%) | Upper Limit (%) | RPD | Lower Limit (%) | Upper Limit (%) | RPD |
| bis(2-Ethylhexyl)phthalate | 0.69 | 2.31 | 67 | 145 | 20 | 54 | 150 | 20 |
| Butylbenzylphthalate | 0.77 | 2.58 | 70 | 135 | 20 | 70 | 145 | 20 |
| Diethylphthalate | 1.08 | 3.61 | 70 | 130 | 20 | 70 | 130 | 20 |
| Dimethylphtalate | 1.93 | 6.43 | 70 | 130 | 20 | 65 | 132 | 20 |
| Di-n-butylphthalate | 2.56 | 8.55 | 70 | 133 | 20 | 70 | 133 | 20 |
| Di-n-octylphtalate | 1.89 | 6.31 | 60 | 132 | 20 | 60 | 137 | 20 |

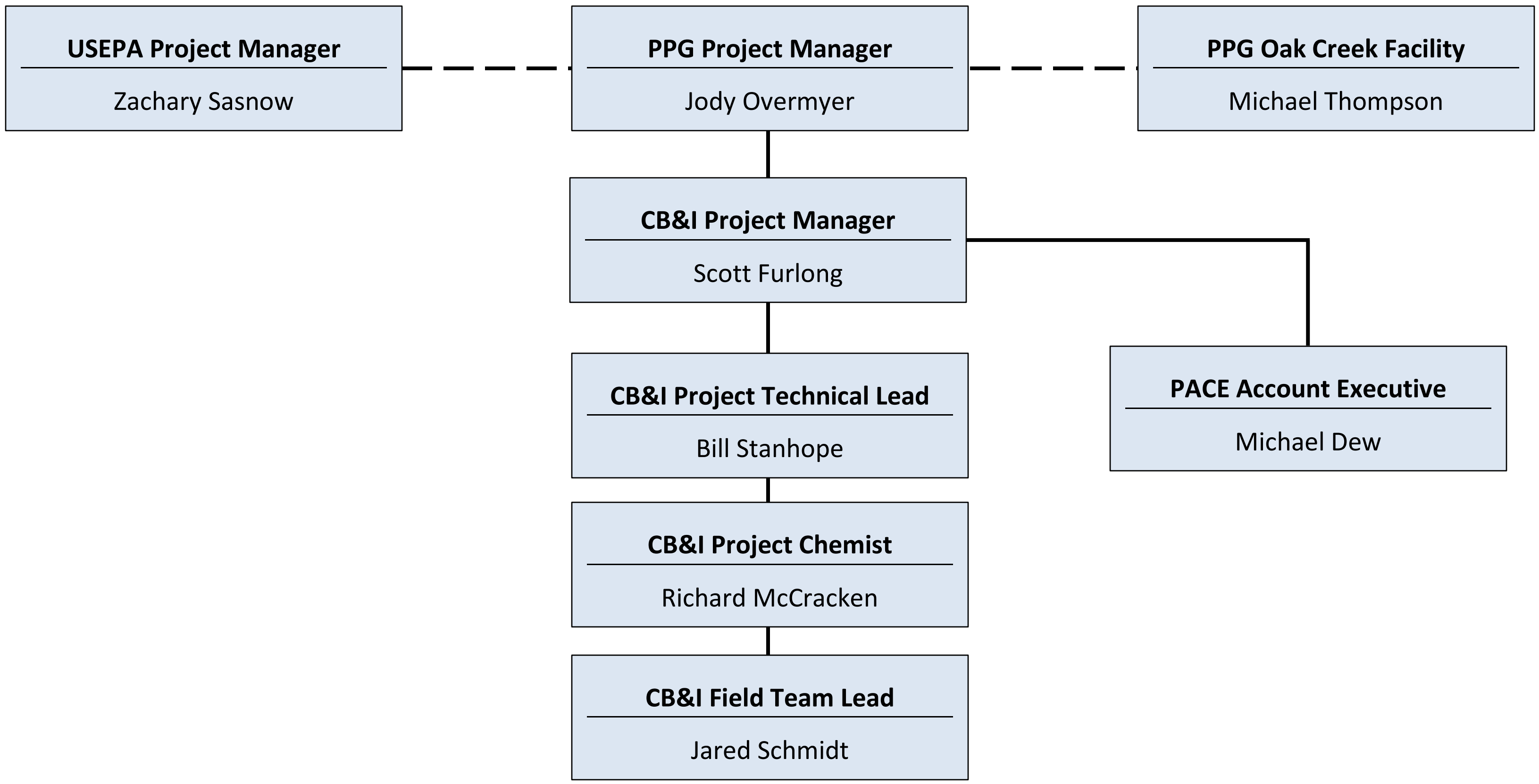
| Surrogate | Recovery Criteria | |
|---|---|---|
| | Lower Limit (%) | Upper Limit (%) |
| 2,4,6-Tribromophenol | 42 | 140 |
| 2-Fluorobiphenyl | 41 | 130 |
| 2-Fluorophenol | 27 | 130 |
| Nitrobenzene-d5 | 43 | 130 |
| Phenol-d6 | 15 | 130 |
| Terphenyl-d14 | 49 | 130 |

# Table A-3
## PPG Oak Creek QAPjP
## Metals Detection Limits, LCS Criteria, MS/MSD Criteria

| Analyte | Method Detection Limit (ug/L) | Practical Quantitation Limit (ug/L) | LCS/LCSD | | | MS/MSD | | |
|---|---|---|---|---|---|---|---|---|
| | | | Lower Limit (%) | Upper Limit (%) | RPD | Lower Limit (%) | Upper Limit (%) | RPD |
| Arsenic | 6.81 | 20.00 | 80 | 120 | 20 | 75 | 125 | 20 |
| Barium | 1.70 | 5.00 | 80 | 120 | 20 | 75 | 125 | 20 |
| Cadmium | 1.00 | 5.00 | 80 | 120 | 20 | 75 | 125 | 20 |
| Chromium | 1.52 | 5.00 | 80 | 120 | 20 | 75 | 125 | 20 |
| Lead | 1.62 | 7.50 | 80 | 120 | 20 | 75 | 125 | 20 |
| Mercury | 0.18 | 0.60 | 85 | 115 | 20 | 85 | 115 | 20 |
| Selenium | 6.85 | 20.00 | 80 | 120 | 20 | 75 | 125 | 20 |
| Silver | 3.16 | 10.00 | 80 | 120 | 20 | 75 | 125 | 20 |

*Figure*

**Figure A-1**
**Project Organization Chart**
**Former TFA Statement of Basis Groundwater Sampling**
**PPG Oak Creek**



# *Appendix A*

## *CB&I Standard Operating Procedures*

# EID-FS-001: Field Logbook

## 1. PURPOSE

This procedure is intended to communicate the requirements for selection, use, and maintenance of all field logbooks. Field logbooks are often used to document observations, sampling information, and other pertinent information on project sites. They are considered legal documents and should be maintained and documented accordingly as part of the project file.

## 2. SCOPE

This procedure is applicable to all Shaw E & I site operations where field logbooks are utilized to document all site activities and pertinent information.

## 3. REFERENCES

- Nielsen Environmental Field School, 1997, *Field Notebook Guidelines*

## 4. DEFINITIONS

- **Significant detail**—Any piece and/or pieces of information or an observation that can be considered pertinent to the legal reconstruction of events, description of conditions, or documentation of samples and/or sampling procedures.
- **Significant event**—Any event or events that could influence or be considered pertinent to a specific task or function and therefore require documentation in the Field Logbook.
- **Field Logbook**—Logbooks used at field sites that contain detailed information regarding site activities that must include dates, times, personnel names, activities conducted, equipment used, weather conditions, etc. Field logbooks can be used by a variety of different field personnel and are part of the project file.

## 5. RESPONSIBILITIES

### 5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

### 5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

## 6. PROCEDURE

### 6.1 General

Each site or operation, as applicable, will have one current Logbook, which will serve as an index of all activities performed at the site or in the task performance. The Logbook is initiated at the start of the first applicable activity. Summary entries are made for every day that covered activities take place. Multiple field logbooks may be used depending upon the number of different types of field personnel conducting work and the various activities at the site. These field logbooks and the site logbooks shall be made part of the project files.

Information recorded in field logbooks includes observations (significant events and details), data, calculations, time, weather, and descriptions of the data collection activity, methods, instruments, and results. Additionally, the field logbook may contain descriptions of wastes, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

### 6.2 Equipment and Materials

- Logbook(s), bound with numbered pages, hard-covered, waterproof preferred. One per project or separate significant task (example-treatment residual composite collection).
- Indelible black or dark blue ink pen
- Other items needed to perform required tasks: compass, ruler, calculator, etc.

### 6.3 Preparation

Site personnel responsible for maintaining field logbooks must be familiar with the SOPs for all tasks to be performed.

Field logbooks are project files and should remain with project documentation when not in use. *Personnel should not keep Field logbooks in their possession when not in use. Field logbooks should only leave the project site for limited periods, and they should always be returned to the site files or the designated on-site location (Sampler's Trailer, etc.)*.

Field logbooks shall be bound with lined, consecutively numbered pages. All pages must be numbered prior to initial use of the field logbook.

The front cover shall include the following information:

- Project Number
- Project Name and Task(s) included in logbook
- Dates covered by logbook—the starting date must be entered on the first day of use
- Logbook number—if more than one logbook will be needed to cover project/task(s)

The inside front cover shall contain a listing and sign-off of each person authorized to make entries and/or review the logbook. All persons who make entries or review/approve such entries must signify their authority to enter into the logbook via their signature and the date of their signing on the inside front cover. If initials are used for entries instead of full names, the initials must be entered beside the full name on the inside cover.

### 6.4 Operation

The following requirements must be met when using a field logbook:

- Record significant details and/or events, work, observations, material quantities, calculations, drawings, and related information directly in the field logbook. If data-collection forms are in use, the information on the form need not be duplicated in the field logbook. However, any forms used to record site information *must be referenced* in the field logbook.

- Information must be factual and unbiased.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Write in black or dark blue indelible ink.
- Do not erase, scribble over, or blot out any entry. Do not use White-Out or like correction items. Before an entry has been signed and dated, changes may be made; however, care must be taken not to obliterate what was written originally. Indicate any deletion by a single line through the material to be deleted. Any change shall be initialed and dated. Error codes (Attachment 1) should be added to the end of the deleted entry. All error codes should be circled.
- Do not remove any pages from the book.
- Do not use loose paper and copy into the field logbook later.
- Record sufficient information to completely document field activities and all significant details/events applicable to the project/task(s) covered by the logbook.
- All entries should be neat and legible.

Specific requirements for field logbook entries include the following:

- Initial and date each page.
- Sign and date the final page of entries for each day.
- Initial, date, and if used, code all changes properly.
- Draw a diagonal line through the remainder of the final page at the end of the day.
- Record the following information on a daily basis:

  a) Date and time

  b) Name of individual making entry

  c) Detailed description of activity being conducted including well, boring, sampling, location number as appropriate

  d) Unusual site conditions

  e) Weather conditions (i.e., temperature, cloud cover, precipitation, wind direction and speed) and other pertinent data

  f) Sample pickup (chain-of-custody form numbers, carrier, time)

  g) Sampling activities/sample log sheet numbers

  h) Start and completion of borehole/trench/monitoring well installation or sampling activity

  i) Health and Safety issues, such as PPE upgrades, monitoring results, near-misses, and incidents associated with the logbook areas

  j) Instrumentation calibration details

Entries into the field logbook shall be preceded with the time of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded unless they are documented by automatic methods (e.g., data logger) or on a separate form required by an operating procedure. In such cases, the field logbook must reference the automatic data record or form.

While sampling, make sure to record observations such as color and odor. Indicate the locations from which samples are being taken, sample identification numbers, the order of filling bottles, sample volumes, and parameters to be analyzed. If field duplicate samples are being collected, note the duplicate pair sample identification numbers. If samples are collected that will be used for matrix spike and/or matrix spike/matrix spike duplicate analysis, record that information in the field logbook.

A sketch of the station location may be warranted. All maps or sketches made in the field logbook should have descriptions of the features shown and a direction indicator. There must be at least one fixed point with measurements on any map drawn. Maps and sketches should be oriented so that north is towards the top of the page.

Other events and observations that should be recorded include (but are not limited to) the following:

- Changes in weather that impact field activities
- Visitors to the site associated with the covered task(s). Note their time of arrival and departure and provide a brief summary of their purpose on site.
- Subcontractor activities applicable to the covered task(s)
- Deviations from procedures outlined in any governing documents, including the reason for the deviation. Deviations from procedures must be accompanied with the proper authorization.
- Significant events that may influence data, such as vehicles in the vicinity of VOC sampling efforts
- Problems, downtime, or delays
- Upgrade or downgrade of personal protective equipment

## 6.5 Post-Operation

To guard against loss of data due to damage or disappearance of field logbooks, all original completed logbooks shall be securely stored by the project. All field logbooks will be copied at the end of each work shift and attached to the daily reports.

At the conclusion of each activity or phase of site work, the individual responsible for the field logbook will ensure that all entries have been appropriately signed and dated and that corrections were made properly (single lines drawn through incorrect information, initialed, coded, and dated). The completed field logbook shall be submitted to the project records file.

## 6.6 Restrictions/Limitations

Field logbooks constitute the official record of on-site technical work, investigations, and data collection activities. Their use, control, and ownership are restricted to activities pertaining to specific field operations carried out by Shaw personnel and their subcontractors. They are documents that may be used in court to indicate and defend dates, personnel, procedures, and techniques employed during site activities. Entries made in these notebooks should be factual, clear, precise, and as non-subjective as possible. Field logbooks, and entries within, are not to be utilized for personal use.

## 7. ATTACHMENTS

- Attachment 1, Common Data Error Codes

## 8. FORMS

None

## 9. RECORDS

- Field Logbook

## 10. REVISION HISTORY AND APPROVAL

| Revision Level / Revision Date | Revision Description | Responsible Manager |
|---|---|---|
| 00<br>6/5/2003 | Initial Issue | N/A |
| 01<br>9/8/2006 | New template, new numbering of procedure, Section 1 Purpose- content added, Section 2 edited, Section 4-Definitions edited. Sections 6.2, 6.3, 6.4, 6.5 and 6.6 were all edited. | Guy Gallello |
| 02<br>8/25/2011 | Modified format only to align with Governance Management framework | Scott Logan |

**Attachment 1**
**Common Data Error Codes**

COMMON DATA ERROR CODES

| | |
|---|---|
| RE | Recording Error |
| CE | Calculation Error |
| TE | Transcription Error |
| SE | Spelling Error |
| CL | Changed for Clarity |
| DC | Original Sample Description Changed After Further Evaluation |
| WO | Write Over |
| NI | Not Initialed and Dated at Time of Entry |
| OB | Not Recorded at the Time of Initial Observation |

All Error Codes should be circled.

# EID-FS-003: Chain of Custody Documentation - Paper

## 1. PURPOSE

The purpose of this procedure is to provide the requirements for completion of written Chain of Custody (COC) documentation and to provide a suggested Chain of Custody Form for project use.

## 2. SCOPE

This procedure is applicable to all Shaw E & I efforts where samples are transferred among parties, including to off-site testing facilities. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, e.g. sampling and then field-screening in a mobile laboratory.

## 3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3.
- Shaw E & I, 2002, *Sampler's Training Course Handout*.

## 4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in an individual's custody when it is in actual physical possession of the person, is in view of the person, is locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Chain of Custody Form**—A form used to document and track the custody and transfers of a sample from collection to analysis or placement in a designated secure area within the testing facility.
- **COC Continuation Page**—Additional page(s) that may be included with a Chain of Custody form. The continuation page(s) contain the information on additional samples contained within the *same* cooler/shipping container associated with the cooler/shipping container Chain of Custody form.

## 5. RESPONSIBILITIES

### 5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

### 5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

## 6. PROCEDURE

### 6.1 Documentation

All Chain of Custody documentation must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

### 6.2 Continuation Pages

Continuation pages may be utilized for shipping containers/coolers with sufficient samples/sample containers that all of the lines of the Chain of Custody form are used before the documentation of the cooler/shipping container is complete. The number of pages in total must be filled out. *All samples entered onto a Continuation Page must be included in the same cooler/shipping container as those on the Chain of Custody form itself.*

### 6.3 Header Information

- Each Chain of Custody form must be assigned a unique Reference Document Number–use the Project/proposal number followed by a unique numeric sequence or current date (if only one cooler sent per day). Continuation Pages should contain the same Document Reference Number as the Chain of Custody form that they are associated with. The project team should maintain a log of Chain of Custody Reference Document Numbers.
- The page identifier and total page count section must be completed. Total pages include the Chain of Custody form and any attached Continuation Pages.
- Project number, name, and location information must be completed for all forms.
- If available, the laboratory Purchase Order Number should be included on the appropriate line.
- The name and phone number of the *Project Contact* should be included; the Project Contact should be a responsible individual that the laboratory may access to address analytical issues. This person is usually the analytical lead for the project.
- The *Shipment Date* should be provided on the applicable lines.
- If shipping by carrier, the *Waybill/Airbill Number* must be included. Note: couriers will not sign custody documents. Therefore, inclusion of the waybill/airbill number on the Chain of Custody is the *only* means of documenting the transfer to the carrier.
- Laboratory Destination and Contact information should be provided.
- The Sampler(s) names should be provided on the appropriate line. This line should include all persons whose initials appear on any of the sample containers, to provide the laboratory a means of cross-referencing containers.
- The “Send Report To” information should be completed. If multiple reports/locations are needed, the information should be provided on a separate page included with the Chain of Custody documents.

### 6.4 Sample Information Section–Including on Continuation Page(s)

During actual sampling, each sample must be entered on the COC form at the time of collection in order to document possession. The sampler must not wait until sampling is completed before entering samples on the COC.

- Complete the *Sample ID Number* for each line. If there are multiple container types for a sample, use additional lines to indicate the needed information.
- Ensure that the *Sample Description* matches the description on the sample label–the laboratory will use this information for cross-referencing.
- Provide the *Collection Date* and *Time*. These must match those on the sample label and Field Logbook/Logsheets.
- Indicate whether the sample is a Grab or Composite sample.
- Indicate the *Matrix* of the sample. Use the Matrix Codes listed on the Chain of Custody form.
- Indicate the *Number of Containers* and the *Container Type*. If a sample has multiple container types, use multiple lines and cross-out the information spaces to the left of the container blocks. *Failure to do this may cause the laboratory to log-in each container type as a separate sample/lab-ID, resulting in a confused report and invoice.*
  - Alternatively, if each sample has the same number/type container types, use "various" in the *Container Type* block and provide detail in the *Special Instructions* section, e.g., "Each sample consists of one 16-oz jar, two pre-weighed VOC w/DI water, and one pre-weighed VOC w/Methanol."
- Check the appropriate *Preservative* box for each line/container type.
- Write in and check the *Analyses Requested* boxes for each line/container type. The appropriate method number (e.g., EPA Method 8260C) must be written as well as the method name.
- Indicate the *Turn-around Time Requested* for each sample.
- Use the *Special Instructions* section to provide important information to the laboratory, e.g., samples that may require dilution or samples that will need to be composited by the laboratory. This section may also be used to inform the laboratory of additional information contained in attachments to the Chain of Custody package.
- Circle the appropriate *QC/Data Package Level* requested.

### 6.5 Custody Transfer Section

- The first *Relinquished By* space must be completed by the individual who will either transfer the samples or seal the shipping container.
- If the samples will be transferred to a courier, write the courier/carrier company in the *Received By* box and enter the Date and Time that the shipping container was closed.
- All other transfers must be performed in person, and the Relinquisher must witness the signing by the Receiver.
- A copy of the Chain of Custody form and all associated Continuation Pages should be maintained in the project files.

## 7. ATTACHMENTS

None

## 8. FORMS

- EID-FS-003.01, Shaw E & I Chain of Custody Form
- EID-FS-003.02, Shaw E & I COC Continuation Page

## 9. RECORDS

- EID-FS-003.01, Chain of Custody Form
- EID-FS-003.02, Chain of Custody Continuation Page(s)

## 10. REVISION HISTORY AND APPROVAL

| Revision Level / Revision Date | Revision Description | Responsible Manager |
| --- | --- | --- |
| 00<br>07/22/2003 | Initial Issue | N/A |
| 01<br>09/08/2006 | New template, new numbering of procedure, Section 6.3 was edited, content was added in Section 6.4 | Guy Gallello |
| 02<br>08/25/2011 | Modified format only to align with Governance Management framework | Scott Logan |

# EID-FS-012:  Shipping and Packaging of Non-Hazardous Samples

## 1. PURPOSE

The purpose of this procedure is to provide general instructions in the packaging and shipping of non-hazardous samples. The primary use of this procedure is for the transportation of samples collected on site to be sent off site for physical, chemical, and/or radiological analysis.

## 2. SCOPE

This procedure applies to the shipping and packaging of all non-hazardous samples. Non-hazardous samples are those that do not meet any hazard class definitions found in 49 CFR 107-178, including materials designated as Class 9 materials and materials that represent Reportable Quantities (hazardous substances) and/or materials that are not classified as *Dangerous Goods* under current IATA regulations.

In general most soil, air, and aqueous samples, including those that are acid or caustic preserved do **not** qualify as *hazardous materials* or *dangerous goods*. An exception is methanolic soil VOC vials: these containers are flammable in any quantity and **must** be packaged, shipped, and declared as *Dangerous Goods* whenever transported by air.

The Class 9 “Environmentally Hazardous” designation should only be applied to samples if they are known or suspected (via screening) to contain a sufficient concentration of contaminant to pose a health and/ or environmental risk if spilled in transport. Samples for which screening has shown a potential hazard (i.e. flammability) or those that are derived from a known hazard, including a site/facility with confirmed contamination by an *infectious substance* must also be shipped in accordance with the applicable DOT/IATA requirements. Refer to Shaw E & I SOP FS013.

*Improper shipment of hazardous materials, especially willful misrepresentation and shipment as non-hazardous materials, is a violation of federal law and is punishable by fines and possible imprisonment of the guilty parties. It is also a violation of Shaw E & I policy and can result in disciplinary action up to and including termination of employment.*

## 3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.
- U.S. Department of Transportation Regulations, 49 CFR Parts 108-178
- International Air Transport Association (IATA), *Dangerous Goods Regulations*, current edition.

## 4. DEFINITIONS

- **Cooler/Shipping Container**—Any hard-sided insulated container meeting DOT’s or IATA’s general packaging requirements.
- **Bubble Wrap**—Plastic sheeting with entrained air bubbles for protective packaging purposes.

## 5. RESPONSIBILITIES

### 5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

### 5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

## 6. PROCEDURE

### 6.1 Packaging

- Use tape and seal off the cooler drain on the inside and outside to prevent leakage.
- Place packing material on the bottom on the shipping container (cooler) to provide a soft impact surface.
- Place a large (30-55 gallon or equivalent) plastic bag into the cooler (to minimize possibility of leakage during transit).
- Starting with the largest glass containers, wrap each container with sufficient bubble wrap to ensure the best chance to prevent breakage of the container.
- Pack the largest glass containers in the bottom of the cooler, placing packing material between each of the containers to avoid breakage from bumping.
- Double-bag the ice (chips or cubes) in gallon- or quart-sized resealable plastic freezer bags and wedge the ice bags between the sample bottles.
- Add bagged ice across the top of the samples.
- When sufficiently full, seal the inner protective plastic bag, and place additional packing material on top of the bag to minimize shifting of containers during shipment.
- Tape a gallon-sized resealable plastic bag to the inside of the cooler lid, place the completed chain of custody document inside, and seal the bag shut.
- Tape the shipping container (cooler) shut using packing tape, duct tape, or other tear-resistant adhesive strips. Taping should be performed to ensure the lid cannot open during transport.
- Place a custody seal on two separate portions of the cooler, to provide evidence that the lid has not been opened prior to receipt by the intended recipient.

### 6.2 Labeling

- A “This Side Up” arrow should be adhered to all sides of the cooler, especially ones without obvious handles.
- The name and address of the receiver and the shipper must be on the top of the cooler.
- The airbill must be attached to the top of the cooler.

### 6.3 Shipping Documentation

- A Cooler Shipment Checklist (Attachment 1) should be completed and kept in the project file.

## 7. ATTACHMENTS

- Attachment 1, Shaw E & I Cooler Shipment Checklist

## 8. FORMS

None

## 9. RECORDS

- Chain of Custody Form
- Chain of Custody Continuation Page(s)
- Cooler Shipment Checklist

## 10. REVISION HISTORY AND APPROVAL

| Revision Level / Revision Date | Revision Description | Responsible Manager |
| --- | --- | --- |
| 00<br>06/05/2003 | Initial issue | N/A |
| 01<br>09/08/2006 | Updated template and numbering of procedure, content was added to Section 2-Scope | Guy Gallello |
| 02<br>08/25/2011 | Modified format only to align with Governance Management framework. | Scott Logan |

## Attachment 1
## Sample Shipment Checklist

Project Name ____________________ Project Number ____________________

Address ____________________ Date____________ Time ____________

City, State, Zip ____________________ Fax No.____________________

Site Contact No. ____________________

| SAMPLE CHECKLIST | YES | NO | COMMENTS |
|---|---|---|---|
| SAMPLE LIDS ARE TIGHT AND CUSTODY SEALS IN PLACE? | ☐ | ☐ | ____________ |
| ARE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER LABEL INFORMATION LEGIBLE AND COMPLETE? | ☐ | ☐ | ____________ |
| HAVE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER SAMPLING DATA BEEN LOGGED INTO THE SAMPLE LOG BOOK? | ☐ | ☐ | ____________ |
| DO SAMPLE NUMBERS AND SAMPLE DESCRIPTIONS ON THE LABELS MATCH THOSE ON THE COC? | ☐ | ☐ | ____________ |
| HAVE THE SAMPLES BEEN PROPERLY PRESERVED? | ☐ | ☐ | ____________ |
| HAVE THE CHAIN OF CUSTODIES BEEN FILLED OUT COMPLETELY AND CORRECTLY? | ☐ | ☐ | ____________ |
| DOES THE ANALYTICAL SPECIFIED ON THE COC MATCH THE ANALYTICAL SPECIFIED IN THE SCOPE OF WORK? | ☐ | ☐ | ____________ |
| HAVE THE COC'S BEEN PROPERLY SIGNED IN THE TRANSFER SECTION? | ☐ | ☐ | ____________ |

| PACKAGING CHECKLIST | YES | NO | COMMENTS |
|---|---|---|---|
| HAS EACH SAMPLE BEEN PLACED INTO AN INDIVIDUAL PLASTIC BAG? | ☐ | ☐ | ____________ |
| HAS THE DRAIN PLUG OF THE COOLER BEEN TAPED CLOSED WITH WATER PROFF TAPE FROM THE INSIDE? | ☐ | ☐ | ____________ |
| HAVE ALL THE SAMPLES BEEN PLACED INTO THE COOLER IN AN UPRIGHT POSITION? | ☐ | ☐ | ____________ |
| IS THERE ADEQUATE SPACING OF SAMPLES SO THAT THEY WILL NOT TOUCH DURING SHIPMENT? | ☐ | ☐ | ____________ |
| HAVE AN ADEQUATE NUMBER OF BLUE ICE PACKS OR WATER ICE BEEN PLACED AROUND AND ON TOP OF THE SAMPLE? | ☐ | ☐ | ____________ |
| HAS FRESH BLUE ICE OR WATER ICE BEEN ADDED TO THE COOLER THE DAY OF THE SHIPMENT? | ☐ | ☐ | ____________ |
| HAS THE COOLER BEEN FILLED WITH ADDITIONAL CUSHIONING MATERIAL? | ☐ | ☐ | ____________ |
| HAS THE COC BEEN PLACE IN A ZIPLOCK BAG AND TAPED TO THE INSIDE OF THE LID OF THE COOLER? | ☐ | ☐ | ____________ |
| HAVE CUSTODY SEALS BEEN PLACED ONTO THE LID? | ☐ | ☐ | ____________ |
| HAS THE COOLER BEEN LABELED "THIS SIDE UP"? | ☐ | ☐ | ____________ |
| IF REQUIRED, HAS THE COOLER BEEN LABELED WITH THE DOT PROPER SHIPPING NAME, UN NUMBER AND LABEL? | ☐ | ☐ | ____________ |
| HAS THE LABORATORY PERFORMING THE ANALYSES BEEN NOTIFIED OF THE SHIPMENT OF SAMPLES? | ☐ | ☐ | ____________ |

PROBLEMS/RESOLUTIONS: ______________________________

______________________________________________

______________________________________________

PREPARED BY: ____________________ SIGNATURE ____________________

# EID-FS-111: Low Flow/Micro-Purge Well Sampling

## 1. PURPOSE

This procedure is intended to provide methods for low-flow sampling of groundwater from monitoring wells. Low-flow or micro-purge sampling is a method of collecting samples from a well that does not require the removal of large volumes of water from the well and therefore does not overly agitate the water and suspended particles or potentially aspirate VOCs. The method entails the removal of water directly from the screened interval without disturbing any stagnant water above the screen by pumping the well at low enough flow rates to maintain minimal drawdown of the water column followed by in-line sample collection. Typical flow rates for low-flow sampling range from 0.1 L/min to 0.5 L/min depending on site characteristics.

## 2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater samples will be collected from a monitoring well using low-flow or micro-purge methods and where no project/program specific procedure is in use.

## 3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society for Testing and Materials, D6771-02, *Standard practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations*, West Conshohocken, PA.
- American Society for Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA .
- U.S. Environmental Protection Agency Region 1, 1996, *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*, SOP GW0001, Revision 2, July 30.

## 4. DEFINITIONS

- **Low Flow**—Refers to the velocity that is imparted during pumping to the formation adjacent to the well screen, not necessarily the flow rate of the water discharged by the pump at the surface.
- **Micro-purge**—Another term for low-flow sampling referred to as such due to the fact that pre-sampling groundwater removal (purging) is performed at flow rates 2 to 3 orders of magnitude less than typical bailer or pump methods.
- **Pump**—An electric, compressed air, or inert gas driven device that raises liquids by means of pressure or suction. The types of pumps used for well purging should be chosen based on the well size and depth, the type of contaminants, and the specific factors affecting the overall performance of the sampling effort. Low flow/micro-purge sampling is performed using specially constructed pumps, usually of centrifugal, peristaltic, or centrifugal submersible design, with low draw rates (<1.0L/min).
- **Well Purging**—The action of removing groundwater using mechanical means from a monitoring well prior to collecting groundwater samples. Purging removes the stagnant

groundwater from the column allowing the groundwater surrounding the well screen to enter the collection zone.

## 5. RESPONSIBILITIES

### 5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

### 5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These aspects may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

## 6. PROCEDURE

Low-flow/micro-purge sampling involves removing water directly from the screened interval without disturbing any stagnant water above the screen or without lowering the water table. Since it is not based upon the removal of well volumes, it requires in-line monitoring of water quality parameters which may include pH, specific conductivity, temperature, dissolved oxygen, and redox potential to determine when the groundwater sample zone has stabilized. The sample is then collected using the same pump directly from the discharge tubing.

### 6.1 Considerations

The following variables should be reviewed in planning for low-flow purging and sampling:

- **Recharge capacity of each well:** The recharge capacity of a well will determine how fast the well should be purged. The purge rate should be no greater than the recharge rate of the groundwater zone to prevent water table drawdown.
- **Well construction details, including well depth, diameter, screened interval, screen size, material of construction, and depth to water table:** The diameter and well depth will determine the size of the pump and the location from which the pump will operate. Peristaltic and suction draw pumps are only viable at depths of less than 25 feet. The pump intake should be placed within the well screen.
- **Pump:** Low-flow purging and sampling can be used in any well that can be pumped at a constant rate of not more than 1.0 L/min. Continuous discharge and cycle discharge pumps with adjustable flow rate controls should be used to avoid causing continuous drawdown. Whenever possible, dedicated pumps should be installed to avoid disturbing the water column.
- **Groundwater quality, including type and concentration of chemical compounds present:** Low-flow methods can be used for all types of aqueous-phase contamination,

including VOCs, SVOCs, metals, pesticides, PCBs, radionuclides, and microbiological constituents. Pump parts and tubing should be made of materials that are compatible with the analytes of interest.

## 6.2 Equipment

The following equipment is recommended for use in conducting well purging:

- Pump capable of <1.0L/min draw rates
- Discharge line constructed of material compatible with the contaminants of interest. Enough for a fresh line to be used at each well
- Water level indicator
- Flow-through Water Quality Meter (pH, specific conductance, temperature, optional Dissolved Oxygen, Redox potential)–calibrated
- Nephelometer–for turbidity measurement-calibrated (if required)
- Photoionization Detector (PID)–calibrated (if screening for VOCs is required)
- Drums or tanks to contain the purge water
- Field log book
- Calculator
- Plastic sheeting
- Sample containers and preservatives
- Ice and Ziploc-type bags

## 6.3 Pre-Sampling

To prevent cross-contamination of other wells on-site, upgradient and background wells should be addressed first. It is also a good idea to use fresh discharge line for each well as the low-flows make it difficult to flush contaminants between samples. The procedure for pre-sampling is as follows:

- Prepare the area surrounding the well by placing plastic sheeting on the ground surface to prevent potential cross-contamination of the pump and discharge hose or sample equipment and materials.
- Place and secure the drum, tank, or suitable purge water container in close proximity to the well for the collection and storage of purge water. *Purge water must be containerized and disposed of in the manner specified in the project/program plan or as the client directs. **Never** return purge water to the well.* If in doubt or where requirements are not specified, handle all purge water as waste and dispose of it accordingly.
- If performing VOC screening, measure and record the background organic vapors in the ambient air using a PID, in accordance with manufacturer recommendations.
- Open the well casing, remove the well cap, and immediately measure and record the organic vapor levels from the head space within the well casing using a PID, in accordance with manufacturer recommendations.
- Measure the depth to the static water level using the water level indicator in accordance with Procedure EI-FS108, *Water Level Measurements*.

### 6.4 Well Purging

The procedure for well purging is as follows:

- Review and understand the proper operating and maintenance instruction for each type of pump that is used prior to placing the pump in the well. Each pump type has specific operating procedures.
- Some wells may include a dedicated pump that is already placed in the well along the well screen. If this is the case, review well construction data to verify the proper placement of the pump intake. Inspect the location where the discharge line and pump support cable exit the well to determine that they are in the proper position (markings should be present at the well head to show this).
- Assemble the pump and clean discharge line in accordance with manufacturer instructions. Ensure the pump discharge line is long enough so that the pump intake can be located within the well screen area and the discharge end can reach the purge water container.
- Slowly lower the pump into the well until it is submerged and at the desired pumping depth.
- Connect the pump discharge to the flow-through water quality meter system in accordance with the manufacturer's procedure.
- Start the pump and begin monitoring discharge rates and volume collected. Adjust flows if necessary to remain in a range of 0.1 to 0.5L/min without exceeding the well discharge rate.
- Monitor and record the pH, conductivity, temperature, dissolved oxygen, redox potential, and turbidity at set intervals (2 to 10 minutes).
- Collect the sample following the procedure below when all monitored water quality parameters are stable, as indicated by three consecutive readings differing by less than 10 percent. For pH use +/-0.3 units as the standard.

### 6.5 Sample Collection

The procedure for sample collection is as follows:

- Prepare the sample bottles and preservatives required for the sampling.
- Don a pair of clean gloves.
- Collect the sample immediately after purging through the pump discharge line.
  - Fill VOA vials first (reduce the flow rate of the pump discharge) allowing the liquid to slowly fill the container without agitation and obtain a meniscus slightly above the top of the vial.
  - Cap and check all VOA vials for entrained air by slowly tipping and observing for bubbles. If any are present, discard the sample and collect again as above.
- Continue filling all required sample bottles.
- Add preservatives to the samples as needed, and place the sample bottles on ice. Note that most sample bottles come with preservatives already added. If such is the case, do not overfill the bottles.
- Replace the well cap, if required, and lock the cover.
- Record the sampling information.

- For a dedicated down-hole pumping system, do not decontaminate the pump but rinse the water quality meter's flow-cell and probes with distilled water.
- If using a non-dedicated pump and meter system, decontaminate the pump and meter.
  - Retrieve the pump and remove and dispose of the discharge line, including the line leading to and from the water quality meter system.
  - Rinse the water quality meter system with distilled water.
  - Attach a few feet of clean line to the pump and water quality meter system with a discharge end into the purge waste container.
  - Place the pump into a container of distilled water, adjust the flow to its maximum, and allow the entire system to flush with distilled water for at least 5 minutes or longer if the waste does not appear to be clean.
- Secure the area by removing equipment and materials, properly dispose of plastic sheeting and other disposable sampling materials, and close the purge water container(s).
- Proceed to the next well and repeat the process using clean discharge tubing for each well sampled.

## 7. ATTACHMENTS

None

## 8. FORMS

None

## 9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet
- Sampling information recorded in Field Logbook or Field Logsheet

## 10. REVISION HISTORY AND APPROVAL

| Revision Level / Revision Date | Revision Description | Responsible Manager |
|---|---|---|
| 00<br>09/21/2006 | Initial issue. | N/A |
| 01<br>09/21/2006 | Updated template and numbering of procedure, minor edits to Sections 6.0 Procedure, 6.2 Equipment, and 6.5 Sample Collection | Guy Gallello |
| 02<br>08/25/2011 | Modified format only to align with Governance Management framework. | Scott Logan |

# Appendix B

# Field Forms

# Well Development Form

## PPG OAK CREEK, WI
## WELL DEVELOPMENT FORM

**Project Number:** ________________________ **Date:** ________________________________

**Well Number:** ________________________ **Weather:** ________________________________

**Casing Dia. (in):**________________________ **Personnel:** ________________________________

**Well Type:** ________________________ ________________________________

**Purge Method:** (circle) Bailer Submersible Pump QWD Other______________________

**PID Reading:** ________________________ **$O_2$ Reading:** ________________________________

**LEL Reading:**________________________

**Depth to Water:** ________________________ **Purge Start Time:** ____________________________

**(A) Total Depth** (after development)**:** ______________ **Purge Stop Time:** ____________________________

**(B) Total Depth** (prior to development)**:** ____________________ (Well Installation Depth)

**Solid Thickness = (B - A)** **Solid Thickness (feet) =** ______________________

**Final Total Depth (Post Development):** ___________**Well Volume (gallons) =** ______________________

| Time | Water Level (ft toc) | Total Depth (ft toc) | Cumulative Water Volume (gallon) | Remarks (odor, color, solids, etc.) |
|---|---|---|---|---|
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**Depth to Water (Pre-Well Testing):** ____________________ **Date/Time:** ______________

**Depth to Water (Post-Well Testing)**:** __________________ **Date/Time:** ______________

**If the water level has recovered to greater than 95 percent of the pre-test level the well should be functioning properly. If not, repeat the development process.

NOTES:

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

# Well Sampling Form

**PPG OAK CREEK, WI**
**WELL SAMPLING FORM**

**Project Number:** ________________________ **Date:** ________________________________

**Well Number:** ________________________ **Weather:** ________________________________

**Casing Dia. (in):** ________________________ **Personnel:** ________________________________

**Well Type:** ________________________ ________________________________

**PID Reading:** ________________________ **$O_2$ Reading:** ________________________________

**LEL Reading:** ________________________ **Methane Reading:** ________________________

**(A) Depth to Water:** ________________________ **(B) Total Well Depth**: ________________________

**Purge Method:** (circle) Bailer Peristaltic Pump Other ________________________________

**Well Volume = (B-A)*conversion factor** (see below)

(0.04 gal/ft for 1” ID; 0.16 gal/ft for 2” ID; 0.65 gal/ft for 4” ID)

**Well Volume (gal) =** ________________________

**Purge Start Time:** ________________________ **Equipment:** ________________________________

**Sample Time:** ________________________

**Sampling Parameters:** ________________________________________________________________

| Time | Water Level (ft toc) | Cumulative Water Volume (gallon) | pH (SU) ±0.3 | Cond. (mS/cm) ±10% | ORP (mV) ±10 | Turb. (NTU) ±10% | Temp. (˚C) ±10% | DO (mg/l) ±10 |
|---|---|---|---|---|---|---|---|---|
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NOTES:

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