# Lower Passaic River Study Area

# Quality Assurance Project Plan

# Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection

# Addendum A

# Water Quality Monitoring for the River Mile 10.9 Removal Action

# Revision 0

Approved By: _____ Date: July 1, 2013
Roger McCready, Project Manager/CH2M HILL

Approved By: _____ Date: July 1, 2013
Andrea DePoy, Project QA Manager/CH2M HILL

# Introduction

This document is an addendum to the *Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection Quality Assurance Project Plan/Field Sampling Plan Addendum* dated July 2012 (AECOM 2012; hereafter referred to as the 2012 Water Column Monitoring QAPP) and includes that document by reference. This Quality Assurance Project Plan (QAPP) Addendum A outlines the Water Quality Monitoring Program associated with dredging and capping operations for the River Mile (RM) 10.9 Removal Action.

The RM 10.9 Removal Action operations (i.e., dredging and capping) may suspend sediments into the water column and may be measureable in the immediate and downstream river environment. Water quality monitoring will be conducted to identify any exceedance of trigger levels. Dredging Best Management Practices (BMPs) will be implemented during the RM 10.9 Removal Action as necessary to reduce the potential for river water quality impacts during the project.

Samples will be collected from within and in the vicinity of the RM 10.9 Removal Area, located in the Lower Passaic River Study Area (LPRSA). Associated Quality Assurance (QA) and Quality Control (QC) activities developed for this program have also been included in this 2013 Water Column Monitoring QAPP Addendum A.

Table 1 provides a key to the 2012 Water Column Monitoring QAPP and this Addendum and includes the following:

- Worksheets that are included by reference as written in the 2012 Water Column Monitoring QAPP (i.e., not revised for this addendum and not included in this addendum);
- Worksheets that are included by reference, but with changes (e.g., analysis of specific analytes) (only changes are included in this addendum); and,
- Worksheets that are revised and included in this addendum.

## Background Information

The LPRSA encompasses the 17.4-mile tidal reach of the Passaic River below the Dundee Dam, its tributaries, and the surrounding watershed that hydrologically drains below the Dundee Dam. The RM 10.9 Study Area extends, bank to bank, between RM 10 and RM 12 of the LPRSA. The RM 10.9 Sediment Deposit Area, an area within the RM 10.9 Study Area, extends approximately 2,380 feet (ft), from RM 10.65 to RM 11.2. The RM 10.9 Removal Area (**Figure 1**) is an approximately 5.6-acre area located on the eastern side of the LPRSA within the RM 10.9 Sediment Deposit Area and extending to the northeast

In June 2012, the Cooperating Parties Group (CPG) signed an Administrative Order on Consent to perform the actions necessary to remove, treat, and/or properly dispose of approximately 20,000 cubic yards ($yd^3$) of sediment from the designated portion (i.e., the Removal Area) of the RM 10.9 Sediment Deposit Area due to elevated concentrations of polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), mercury, and other chemicals of potential concern (COPCs) and the potential for receptors to be exposed to them.

## Sampling Objectives

Details regarding the sampling associated with the water quality monitoring activities are presented in the *Draft River Mile 10.9 Removal Action, Lower Passaic River Study Area, Water Quality Monitoring Plan* (herein referred to as the *RM 10.9 Water Quality Monitoring Plan*; CH2M HILL 2013). The objectives of the monitoring activities include the following:

- Monitor the water quality outside the silt curtains surrounding the dredge areas for increased resuspension during dredging operations
- Quantify select COPC concentrations in the water column during dredging operations
- Adjust operations as needed to achieve desired water quality during dredging

## Sampling Approach

New Jersey Administrative Code (NJAC) 7:14A, Surface Water Discharge Criteria, and NJAC 7:9B, Surface Water Quality Standards, have been identified as relevant and appropriate requirements. The target COPCs are 2,3,7,8-TCDD, total PCB congeners, and mercury. While there are specific surface water effluent standards for these compounds at remediation sites, COPC sampling data cannot be collected and analysed in a suitable timeframe that will allow real-time management of dredging operations. Total suspended solids (TSS) (note that TSS is also referred to in this QAPP Addendum as suspended solids concentration [SSC]) and turbidity provide suitable parameters to assess potential construction-related water quality changes and were selected for water quality monitoring because they can be measured in real-time during the dredging/capping operations. Monitoring of COPCs will be conducted periodically.

Four stationary buoys to monitor turbidity were deployed on May 30-31, 2013 upstream and downstream of the RM 10.9 Removal Area to establish ambient non-dredging baseline conditions and to measure turbidity during dredging and capping operations. In addition, one mobile buoy will be used within the Removal Area to measure turbidity during dredging and capping operations. The locations of the five buoys are shown in Figure 1 and summarized below:

- Fixed Turbidity Buoy #1: Downstream “baseline” location at RM 10.2, approximately 0.5 miles (2,650 ft) downstream of the Removal Area’s southern perimeter boundary
- Fixed Turbidity Buoy #2: Downstream location approximately 200 ft downstream of the RM 10.9 Removal Area’s southern perimeter boundary
- Fixed Turbidity Buoy #3: Upstream location approximately 200 ft upstream of the RM 10.9 Removal Area’s northern perimeter boundary
- Fixed Turbidity Buoy #4: Upstream “baseline” location at RM 11.7, approximately 0.5 miles (2,650 ft) upstream of the Removal Area’s northern perimeter boundary
- Mobile Turbidity Buoy #5: This mobile operational buoy will be moved as needed to monitor turbidity within the Removal Area

At each buoy location, the turbidity monitors were placed at the approximate midpoint of the water column depth as measured at low tide (Buoy #1 – 5 ft below water surface, Buoy #2 – 5 ft, Buoy #3 – 5.5 ft, and Buoy #4 – 7.0 ft). The farthest downstream and upstream monitoring sites (Buoys #1 and #4, respectively) are intended to reflect the ambient conditions of the river (depending on tidal and river stage conditions) and were placed such that they would not be affected by the dredging and capping operations. The monitoring sites adjacent to the Removal Area (Buoys #2 and #3) are intended to reflect conditions due to the dredging and capping operations. The fifth mobile monitoring location (Buoy #5) is intended to provide operational early detection of elevated turbidity levels and allow the project to make adjustments such that the trigger level is not exceeded.

The key sampling tasks are summarized below and presented in detail in the *RM 10.9 Water Quality Monitoring Plan*:

- Baseline Turbidity and TSS Monitoring (pre-dredging, June 2013): Data will be collected to support calculation of site-specific correlations for turbidity, TSS, and COPCs for the RM 10.9 Removal Action using both historical and project specific data. The baseline monitoring event will include surface water monitoring of turbidity (NTU) every 15 minutes for 30 days and collection of TSS samples over a 10-day period to verify and refine the historical turbidity–TSS correlation so that the real-time turbidity monitors can be used as the initial resuspension indicator.

  TSS samples will be collected for 10-days, targeting 3 different tidal periods (ebb, slack [high or low], and flood) each day. These samples will be collected at the four fixed buoy locations from two depths, surface (1 ft below water surface) and mid-depth (mid-point of the water column). Surface water grab samples will be collected along transects at each of the four fixed buoy locations, 3 locations per buoy (west, center, and east channel) and 2 depths (surface and mid-depth) to characterize TSS, particulate organic carbon (POC), dissolved organic carbon (DOC) and turbidity. Composite samples (comprising aliquots from the six transect locations) will also be collected for analysis of select COPCs (PCDDs/PCDFs, total PCB congeners, and mercury), POC, DOC, and TSS.

  In addition to verifying site-specific correlations, the baseline data will be used to identify any needed revisions to the current water quality monitoring program.

- Initial Dredging Monitoring (first 48 hours, July 2013): The turbidity–TSS correlation obtained from the baseline monitoring will be the starting point for the water quality monitoring program. This correlation will be updated as required during the initial dredging operations. During the first 48 hours of dredging, TSS samples will be collected at each of the four fixed buoy locations every 2 hours at surface and mid-depth over an 8-hour period each day. In addition, one composite sample (comprising individual samples collected every 2 hours) will be collected daily at each of the four fixed buoys for analysis of select COPCs (PCDDs/PCDFs, total PCB congeners, and mercury), POC, DOC, and TSS.

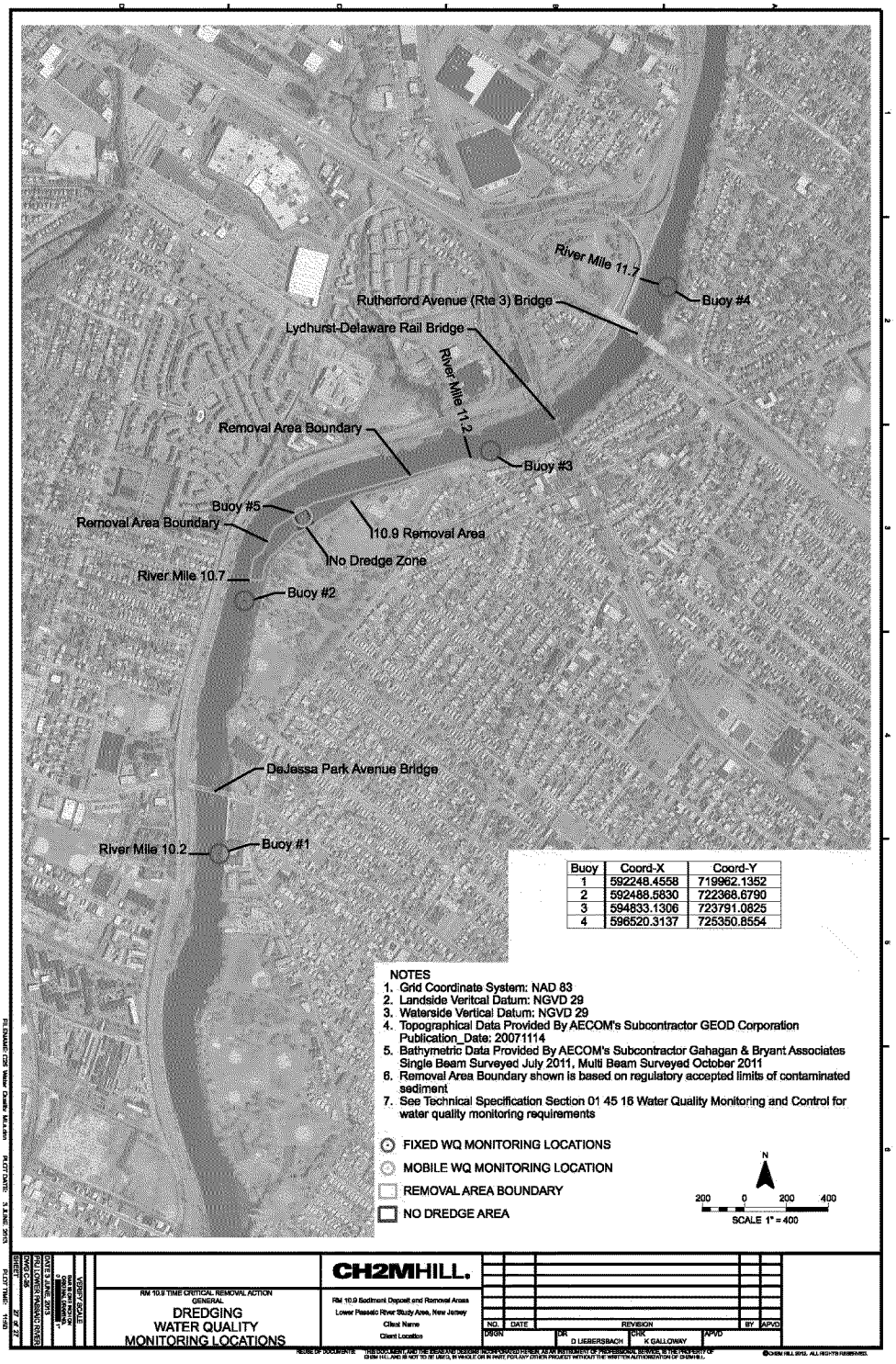
  During this initial phase of monitoring, a two-person crew in a small vessel (e.g., a jon boat) will monitor the for the presence of any visible turbidity plumes downstream of dredging activities using the same type of turbidity monitor used at the four fixed buoy locations. If a plume is observed, TSS samples will be collected from mid-depth. Sampling will start at the dredge and continue at fixed intervals in the direction of current flow within the center of the visible suspended solid plume until the downstream point is reached where turbidity levels return to approximately ambient levels. Surface water TSS sample/turbidity monitoring locations will be surveyed via GPS and recorded.

- Resuspension Monitoring: Once established, the correlation curve will be used to estimate the TSS concentration from the measured turbidity value, and turbidity will be measured continually during dredging operations at the five monitoring locations described earlier. Weekly synoptic (within same tidal cycle) transect sampling will also be conducted at each of the for fixed buoy locations (surface and mid-depth) for analysis of TSS, POC, and DOC in addition to a weekly composite sample to characterize select COPCs (PCDDs/PCDFs, total PCB congeners, and mercury), POC, DOC, and TSS.

  If a turbidity plume is observed, TSS samples will be collected as discussed in the Initial Dredging Monitoring task.

- Event-Based COPC Monitoring (exceedance of Turbidity Action Level): The purpose of this sampling is to collect surface waters if the Turbidity Action Level is exceeded. Sampling locations will be determined real-time based on the turbidity distribution pattern among the four fixed buoy locations. Samples will be analyzed for select COPCs (PCDDs/PCDFs, total PCB congeners, and mercury), POC, DOC, and TSS.

- Two (2) Liter Extraction for the PCDDs/PCDFs Analytical Fraction: The project may require lower detection limits for the PCDDs/PCDFs analytical fraction on specific sample groups. The use of a 2 liter volume extraction technique may be required of the laboratory in order to reach these lower detection limits for the target compounds. Sufficient notice will be given to the laboratory when these samples are to be collected and will be annotated accordingly on the COC document for identification purposes. The laboratory will adjust their detection limits on the final reports according to the extraction volume used in this procedure.




| Buoy | Coord-X | Coord-Y |
|---|---|---|
| 1 | 592248.4558 | 719962.1352 |
| 2 | 592488.5830 | 722368.6790 |
| 3 | 594833.1306 | 723791.0825 |
| 4 | 596520.3137 | 725350.8554 |

**Figure 1: Water Quality Monitoring Locations**

**Table 1. QAPP Worksheet Key**

| Worksheet No. | Worksheet Title | RM 10.9 QAPP Worksheets | | | QAPP Addendum A Worksheet |
|---|---|---|---|---|---|
| | | No Changes | Changes - Additions | Changes - Exclusions | |
| 1 | Title and Approval Page | | | | Replacement |
| 2 | QAPP Identifying Information | | | | Replacement |
| 3 | Distribution List | | | Work to be performed by CH2M HILL and its subcontractors | Changes Only |
| 4 | Project Personnel Sign-Off Sheet | | | Work to be performed by CH2M HILL and its subcontractors | Changes Only |
| 5 | Project Organizational Chart | | | | Replacement |
| 6 | Communication Pathways | | | | Replacement |
| 7 | Personnel Responsibilities and Qualifications Table | | | | Replacement |
| 8 | Special Personnel Training Requirements Table | | | Work to be performed by CH2M HILL and its subcontractors | Changes Only |
| 9 | Project Scoping Session Participants Sheet | | Added Addendum A Scoping Session | | Changes Only |
| 10 | Problem Definition | | | | Replacement |
| 11 | Project Quality Objectives/Systematic Planning Process Statements | | | | Replacement |
| 12 | Measurement Performance Criteria Table | | | Addendum target analytes only | Changes Only |
| 13 | Secondary Data Criteria and Limitations Table | x | | | |
| 14 | Summary of Project Tasks | | | | Replacement |
| 15 | Reference Limits and Evaluation Table | | Added Limits for 2L PCDDs/PCDFs sample | Addendum target analytes only | Changes Only |

| | | | | | |
|---|---|---|---|---|---|
| 16 | Project Schedule/Timeline Table | | | | Replacement |
| 17 | Sampling Design and Rationale | | | | Replacement |
| 18 | Sampling Locations and Methods/SOP Requirements Table | | | | Replacement |
| 19 | Analytical SOP Requirements Table | | | Addendum target analytes only | Changes Only |
| 20 | Field Quality Control Sample Summary Table | | | | Replacement |
| 21 | Project Sampling SOP Reference Table | | Added deployment of equipment from stationary buoys | Work to be performed by CH2M HILL and its subcontractors | Changes only |
| 22 | Field Equipment | | Stationary buoys added to equipment | Work to be performed by CH2M HILL and its subcontractors | Changes only |
| 23 | Analytical SOP Reference Table | | | Addendum target analytes only | See 2012 Water Column Monitoring QAPP Worksheet |
| 24 | Analytical Instrument Calibration Table | | | Addendum target analytes only | See 2012 Water Column Monitoring QAPP Worksheet |
| 25 | Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table | | | Addendum target analytes only | See 2012 Water Column Monitoring QAPP Worksheet |
| 26 | Sample Handling System | | | Work to be performed by CH2M HILL | See 2012 Water Column Monitoring QAPP Worksheet |
| 27 | Sample Custody Requirements | | | Work to be performed by CH2M HILL | See 2012 Water Column Monitoring QAPP Worksheet |
| 28 | QC Samples Table | | | Addendum target analytes only | Changes Only |
| 29 | Project Documents and Records Table | | | Work to be performed by CH2M HILL and its data validation subcontractor | See 2012 Water Column Monitoring QAPP Worksheet |

| | | | | | |
|---|---|---|---|---|---|
| 30 | Analytical Services Table | | | Addendum target analytes only | See 2012 Water Column Monitoring QAPP Worksheet |
| 31 | Planned Project Assessment Table | | | Work to be performed by CH2M HILL; Technical audits and PE samples not applicable. | See 2012 Water Column Monitoring QAPP Worksheet |
| 32 | Assessment Findings and Response Actions | | | Work to be performed by CH2M HILL; Technical audits and PE samples not applicable | See 2012 Water Column Monitoring QAPP Worksheet |
| 33 | QA Management Reports Table | | | Work to be performed by CH2M HILL and its data validation subcontractor | See 2012 Water Column Monitoring QAPP Worksheet |
| 34 | Sampling and Analysis Verification (Step I) Process Table | | | Work to be performed by CH2M HILL and its data validation subcontractor | See 2012 Water Column Monitoring QAPP Worksheet |
| 35 | Sampling and Analysis Validation (Steps IIa and IIb) Process Table | | | Work to be performed by CH2M HILL and its data validation subcontractor | See 2012 Water Column Monitoring QAPP Worksheet |
| 36 | Sampling and Analysis Validation (Steps IIa and IIb) Summary Table | | | Work to be performed by CH2M HILL and its data validation subcontractor | See 2012 Water Column Monitoring QAPP Worksheet |
| 37 | Data Usability Assessment | | | Work to be performed by CH2M HILL and its data validation subcontractor | See 2012 Water Column Monitoring QAPP Worksheet |

***QAPP Worksheet #1 (UFP-QAPP Manual Section 2.1) Title and Approval Page***

**Document Title**: Quality Assurance Project Plan/ Field Sampling Plan Addendum. Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection. Lower Passaic River Restoration Project Addendum A – Water Quality Monitoring for the River Mile 10.9 Removal Action

**Lead Organization**: Cooperating Parties Group and de maximis, inc.

**Preparer's Name and Organizational Affiliation**: Jennifer Wilkie, CH2M HILL

**Preparer's Address and Telephone Number:** 125 South Wacker Drive, Suite 3000, Chicago, IL 60606.

Ph: (312) 873-9795

**Preparation Date (Day/Month/Year):** Revision 0, July 2013

Investigative Organization's Project Manager

Roger McCready/CH2M HILL / July 2013

Investigative Organization's Project Quality Assurance (QA) Manager

Andrea DePoy / CH2M HILL / July 2013

Lead Organization's Project Manager

Willard Potter / Robert Law / Stan Kaczmarek/
de maximis, inc. / July 2013

***QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information***

**Site Name/Project Name:** **Diamond Alkali Operable Unit (OU 2) – LPRRP RI/FS**

**Site Location:** **Lower Passaic River Study Area (LPRSA), New Jersey**
**Site Number/Code :** **CERCLA Document No. 02-2007-2009**
**Operable Unit:** **OU 2**
**Contractor Name:** **CH2M HILL**
**Contractor Number:** **Not Applicable (N/A)**
**Contract Title:** **N/A**
**Work Assignment Number:** **N/A**

1. Identify guidance used to prepare QAPP:

   Uniform Federal Policy for Quality Assurance Project Plans. Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP Manual. Final Version 1. March 2005. Intergovernmental Data Quality Task Force (US Environmental Protection Agency, US Department of Defense, US Department of Energy). USEPA 505-B-04-900A.

2. Identify regulatory program: Comprehensive Environmental Response Compensation, and Liability Act (CERCLA)

3. Identify approval entity: USEPA Region 2

4. Indicate whether the QAPP is a generic or a project-specific QAPP. (circle one)

5. List dates of scoping sessions that were held: May 23, 2013

6. List dates and titles of QAPP and FSP documents written for previous site work, if applicable:

| Title |
|---|
| AECOM 2010b. *Quality Assurance Project Plan/Field Sampling Plan Addendum. Remedial Investigation Water Column Monitoring/Physical Data Collection for the Lower Passaic River, Newark Bay and Wet Weather Monitoring. Lower Passaic River Restoration Project.* Revision 4. AECOM, Westford, MA. March 2010. |
| AECOM 2012. *Quality Assurance Project Plan/Field Sampling Plan Addendum. Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection. Lower Passaic River Restoration Project*. July 2012. Draft Revision 3 |
| AECOM 2011. *Lower Passaic River Study Area River Mile 10.9 Characterization Quality Assurance Project Plan*. Revision 3. Prepared for Cooperating Parties Group, Newark, New Jersey. AECOM, Chelmsford, MA. October 2011. |
| AECOM 2011b. *River Mile 10.9 Hydrodynamic Field Investigation Quality Assurance Project Plan for the Lower Passaic River, Lower Passaic River Restoration Project*, October 2011, Revision 2. |
| CH2M HILL 2013. *Draft River Mile 10.9 Removal Action, Lower Passaic River Study Area, Water Quality Monitoring Plan*. June 2013. |

***QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information***

7. List organizational partners (stakeholders) and connection with lead organization:

   This work will be performed under the requirements of the Settlement Agreement and SOW for the LPRSA portion of the Diamond Alkali Superfund Site with oversight by USEPA and its government partners (e.g., NJDEP). Conducting the work on behalf of the CPG are de maximis, inc. (acting as Project Coordinator for the CPG) and CH2M HILL and its subcontractors.

8. List data users: See item #7 above.

9. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table.
   Provide an explanation for their exclusion below: N/A ____

| Required QAPP Element(s) and Corresponding QAPP Section(s) | Required Information | Crosswalk to QAPP Worksheet No. or Related Documents |
|---|---|---|
| **Project Management and Objectives** | | |
| 2.1 Title and Approval Page | - Title and Approval Page | 1 |
| 2.2 Document Format and Table of Contents<br>2.2.1 Document Control Format<br>2.2.2 Document Control Numbering System<br>2.2.3 Table of Contents<br>2.2.4 QAPP Identifying Information | - Table of Contents<br>- QAPP Identifying Information | 2 |
| 2.3 Distribution List and Project Personnel Sign-Off Sheet<br>2.3.1 Distribution List<br>2.3.2 Project Personnel Sign-Off Sheet | - Distribution List<br>- Project Personnel Sign-Off Sheet | 3<br>4 |
| 2.4 Project Organization<br>2.4.1 Project Organizational Chart<br>2.4.2 Communication Pathways<br>2.4.3 Personnel Responsibilities and Qualifications<br>2.4.4 Special Training Requirements and Certification | - Project Organizational Chart<br>- Communication Pathways<br>- Personnel Responsibilities and Qualifications Table<br>- Special Personnel Training Requirements Table | 5<br>6<br>7<br>8 |
| 2.5 Project Planning/Problem Definition<br>2.5.1 Project Planning (Scoping)<br>2.5.2 Problem Definition, Site History, and Background | - Project Planning Session Documentation (including Data Needs tables)<br>- Project Scoping Session Participants Sheet<br>- Problem Definition, Site History, and Background<br>- Site Maps | 9<br>9<br>10 and Introduction<br>Figure 1 |

***QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information***

| | | |
|---|---|---|
| 2.6 Project Quality Objectives (PQOs) and Measurement Performance Criteria<br>2.6.1 Development of PQOs Using the Systematic Planning Process<br>2.6.2 Measurement Performance Criteria | - Site-Specific PQOs<br>- Measurement Performance Criteria Table | 11<br>12 |
| 2.7 Secondary Data Evaluation | - Sources of Secondary Data and Information<br>- Secondary Data Criteria and Limitations Table | 13 |
| 2.8 Project Overview and Schedule<br>2.8.1 Project Overview<br>2.8.2 Project Schedule | - Summary of Project Tasks<br>- Reference Limits and Evaluation Table<br>- Project Schedule/Timeline Table | 14<br>15<br>16 |
| **Measurement/Data Acquisition** | | |
| 3.1 Sampling Tasks<br>3.1.1 Sampling Process Design and Rationale<br>3.1.2 Sampling Procedures and Requirements<br>3.1.2.1 Sampling Collection Procedures<br>3.1.2.2 Sample Containers, Volume, and Preservation<br>3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures<br>3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures<br>3.1.2.5 Supply Inspection and Acceptance Procedures<br>3.1.2.6 Field Documentation Procedures | - Sampling Design and Rationale<br>- Sample Location Map<br>- Sampling Locations and Methods/ SOP Requirements Table<br>- Analytical Methods/SOP Requirements Table<br>- Field QC Sample Summary Table<br>- Sampling SOPs<br>- Project Sampling SOP References Table<br>- Field Equipment Calibration, Maintenance, Testing, and Inspection Table | 17<br>Figure 1<br>18<br>19<br>20<br>Appendix A (Original QAPP)<br>21<br>22 |
| 3.2 Analytical Tasks<br>3.2.1 Analytical SOPs<br>3.2.2 Analytical Instrument Calibration Procedures<br>3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures<br>3.2.4 Analytical Supply Inspection and Acceptance Procedures | - Analytical SOPs<br>- Analytical SOP References Table<br>- Analytical Instrument Calibration Table<br>- Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table | Appendix B(Original QAPP)<br>23<br>24<br>25 |

***QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information***

| | | |
|---|---|---|
| 3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures<br>3.3.1 Sample Collection Documentation<br>3.3.2 Sample Handling and Tracking System<br>3.3.3 Sample Custody | - Sample Collection Documentation<br>- Handling, Tracking, and Custody SOPs<br>- Sample Container Identification<br>- Sample Handling Flow<br>- Example Chain-of-Custody Form and Seal | 26<br>Appendix A (Original QAPP)<br>27<br>27<br>Appendix A (Original QAPP) |
| 3.4 QC Samples<br>3.4.1 Sampling QC Samples<br>3.4.2 Analytical QC Samples | - QC Samples Table | 28 |
| 3.5 Data Management Tasks<br>3.5.1 Project Documentation and Records<br>3.5.2 Data Package Deliverables<br>3.5.3 Data Reporting Formats<br>3.5.4 Data Handling and Management<br>3.5.5 Data Tracking and Control | - Project Documents and Records Table<br>- Analytical Services Table<br>- Data Management Procedures | 29<br>30 |
| **Assessment/Oversight** | | |
| 4.1 Assessments and Response Actions<br>4.1.1 Planned Assessments<br>4.1.2 Assessment Findings and Corrective Action Responses | - Planned Project Assessments Table<br>- Assessment Findings and Corrective Action Responses Table | 31<br>32 |
| 4.2 QA Management Reports | - QA Management Reports Table | 33 |
| 4.3 Final Project Report | To be completed following data collection | Not Available (NA) |
| **Data Review** | | |
| 5.1 Overview<br>5.2 Data Review Steps<br>5.2.1 Step I: Verification<br>5.2.2 Step II: Validation<br>5.2.2.1 Step IIa Validation Activities<br>5.2.2.2 Step IIb Validation Activities<br>5.2.3 Step III: Usability Assessment<br>5.2.3.1 Data Limitations and Actions from Usability Assessment<br>5.2.3.2 Activities | - Verification (Step I) Process Table<br>- Validation (Steps IIa and IIb) Process Table<br>- Validation (Steps IIa and IIb) Summary Table<br>- Usability Assessment | 34<br>35<br>36<br>37 |

***QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information***

| | | |
|---|---|---|
| 5.3 Streamlining Data Review<br>5.3.1 Data Review Steps To Be Streamlined<br>5.3.2 Criteria for Streamlining Data Review<br>5.3.3 Amounts and Types of Data Appropriate for Streamlining | To be completed following data evaluation | NA |

***QAPP Worksheet #3 (UFP-QAPP Manual Section 2.3.1) Distribution List***

The following persons will receive a copy of the approved Final QAPP, subsequent QAPP revisions, addenda, and amendments:

| QAPP Recipients | Title | Organization | Telephone Number | E-mail Address | Document Control Number |
|---|---|---|---|---|---|
| Stan Kaczmarek | CPG Project Coordinator (alternate) | de maximis, inc. | 908.735.9315 | StanK@demaximis.com | |
| Roger McCready | CH2M HILL Project Manager | CH2M HILL | 937.220.2961 | Roger.McCready@ch2m.com | |
| Jeffrey Hilgaertner | CH2M HILL Regional Environmental Health and Safety (EHS) Manager | CH2M HILL | 520. 333.2718 | Jeffrey.Hilgaertner @ch2m.com | |
| Jennifer Wilkie | CH2M HILL Water Quality Monitoring Task Manager | CH2M HILL | 312.873.9795 | Jennifer.Wilkie@ch2m.com | |
| Andrew Watson | Field Team Lead (FTL)/ | CH2M HILL | TBD | TBD | |
| TBD | Site Safety Officer (SSO) | CH2M HILL | TBD | TBD | |
| Andrea DePoy | Project QA Manager | CH2M HILL | 574.217.7035 | Andrea.DePoy@ch2m.com | |
| Mark Stinnett | Project Chemist | CH2M HILL | 352.384.7180 | Mark.Stinnett@ch2m.com | |
| Mark Kill | Data Management Task Manager | ddms | 651.842.4232 | MKill@ddmsinc.com | |
| TBD | Data Validation Services | Laboratory Data Consultants | TBD | TBD | |
| Mark Stinnett | Data Validation Coordinator | CH2M HILL | 352.384.7180 | Mark.Stinnett@ch2m.com | |
| Ken Cadmus | Vessel Subcontractor Lead | Ocean Survey, Inc. | 860.388.4631 | kac@oceansurveys.com | |
| TBD | Dredging and Capping Subcontractor | Great Lakes Dredge and Dock Company | TBD | TBD | |

***QAPP Worksheet #4 (UFP-QAPP Manual Section 2.3.2) Project Personnel Sign-Off Sheet***

**Organization:** A completed sign-off sheet will be maintained in the files for each organization represented below.

| QAPP Recipients | Title | Organization | Telephone Number | E-mail Address | Document Control Number |
|---|---|---|---|---|---|
| Stan Kaczmarek | CPG Project Coordinator (alternate) | de maximis, inc. | 908.735.9315 | StanK@demaximis.com | |
| Roger McCready | CH2M HILL Project Manager | CH2M HILL | 937.220.2961 | Roger.McCready@ch2m.com | |
| Jeffrey Hilgaertner | CH2M HILL Regional Environmental Health and Safety (EHS) Manager | CH2M HILL | 520. 333.2718 | Jeffrey.Hilgaertner @ch2m.com | |
| Jennifer Wilkie | CH2M HILL Water Quality Monitoring Task Manager | CH2M HILL | 312.873.9795 | Jennifer.Wilkie@ch2m.com | |
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| TBD | Site Safety Officer (SSO) | CH2M HILL | TBD | TBD | |
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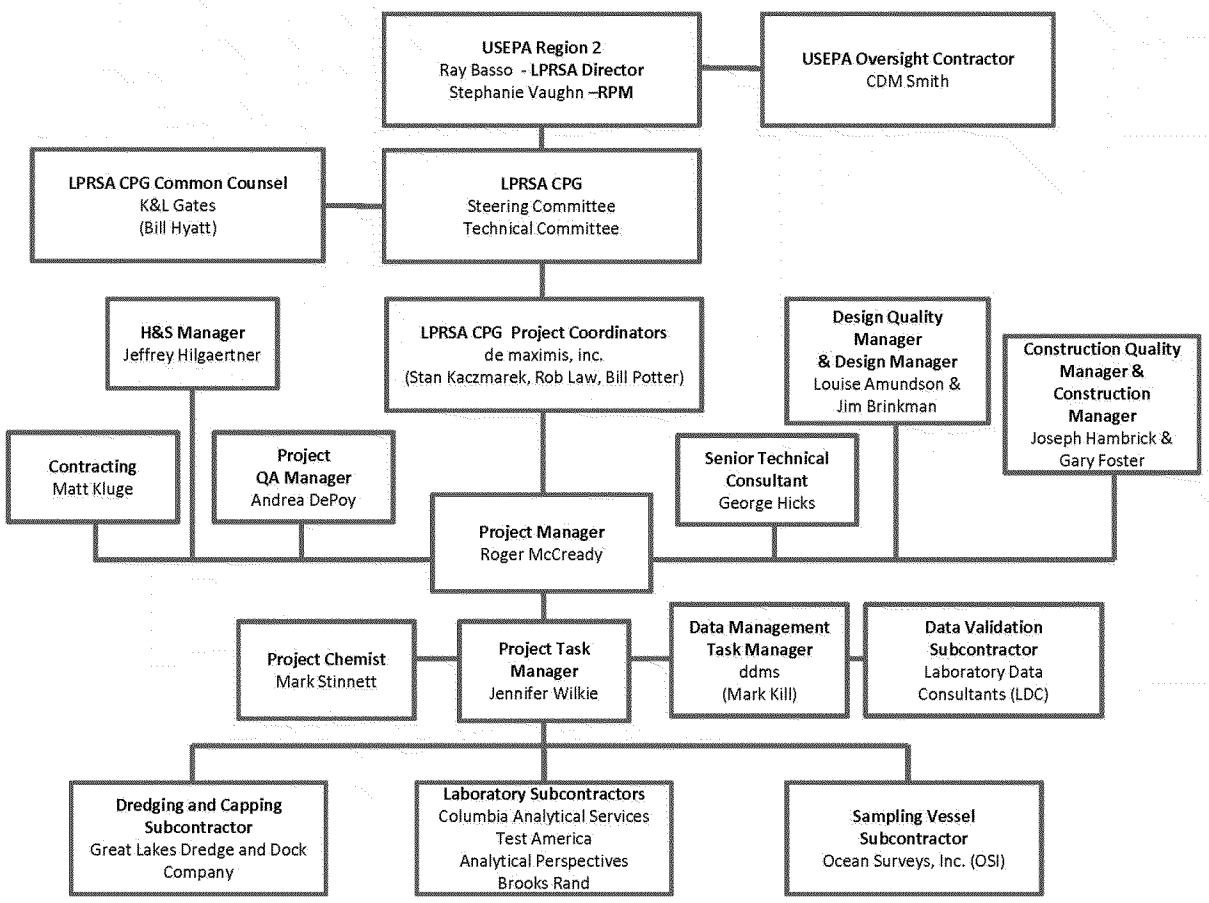
| Mark Stinnett | Project Chemist | CH2M HILL | 352.384.7180 | Mark.Stinnett@ch2m.com | |
| Mark Kill | Data Management Task Manager | ddms | 651.842.4232 | MKill@ddmsinc.com | |
| TBD | Data Validation Services | Laboratory Data Consultants | TBD | TBD | |
| Mark Stinnett | Data Validation Coordinator | CH2M HILL | 352.384.7180 | Mark.Stinnett@ch2m.com | |
| Ken Cadmus | Vessel Subcontractor Lead | Ocean Survey, Inc. | 860.388.4631 | kac@oceansurveys.com | |
| TBD | Dredging and Capping Subcontractor | Great Lakes Dredge and Dock Company | TBD | TBD | |

***QAPP Worksheet #5 (UFP-QAPP Manual Section 2.4.1) Project Organizational Chart***



***QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathway***

| Communication Drivers | Responsible Entity | Name | Phone Number | Procedure (timing, pathways, etc.) |
|---|---|---|---|---|
| Field activities status and issues | CH2M HILL Field Team Lead (FTL) | Andrew Watson | Cell 973.316.3553 | Communicate, as needed with CH2M HILL PM, subcontractors, and CH2M HILL project team directly, or via e-mail or phone.<br>Minor work plan deviations and/or proposed revisions will be documented and communicated in writing, with a copy sent to USEPA via CPG Project Coordinators. |
| | CPG Project Coordinator | Robert Law/ Bill Potter/ Stan Kaczmarek (de maximis, inc.) | 908.735.9315 | Communicate daily with USEPA RPM via e-mail or phone. |
| Sampling progress/laboratory coordination | CH2M HILL Water Quality Monitoring Task Manager | Jennifer Wilkie | 312.873.9795<br>Cell 224.659.9101 | Communicate as needed with CH2M HILL Project Chemist via e-mail or phone. |
| Health and safety briefings and updates | CH2M HILL FTL | TBD | TBD | Communicate, as needed, with field personnel and vendors directly, or via e-mail or phone. |
| Significant health and safety concerns or incidents | CH2M HILL FTL | TBD | TBD | Communicate immediately with CH2M HILL Regional EHS Manager, CH2M HILL PM. |
| Sampling vessel operations | Sampling Vessel Captain | To be determined OSI | 860.388.4631 | Communicate daily, or as needed, with CH2M HILL FTL directly. The sampling vessel captain has the ultimate authority for stopping work while working on water. The vessel captain, in consultation with the SSO, will follow guidelines documented in the site-specific Health and Safety Plan (HASP). In addition, standard safe boating practices related to weather conditions and vessel operations will apply, even if not specifically addressed in the HASP. |

***QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathway***

| | | | | |
|---|---|---|---|---|
| Dredging and Capping Operations | Great Lakes Dredge and Dock Company, Dredging and Capping Operations Lead | TBD | TBD | Communicate daily, or as needed, with CH2M HILL Task Manager directly. The operations lead has the ultimate authority for stopping work while working on water. The operations lead, in consultation with the CH2M HILL FTL, will follow guidelines documented in the site-specific Health and Safety Plan (HASP). In addition, standard safe boating practices related to weather conditions and vessel operations will apply, even if not specifically addressed in the HASP. |
| Analytical laboratory issues, including coordination with field, bench-scale treatability testing, schedule, and technical issues | CH2M HILL Project Chemist | Mark Stinnett | 352.384.7180 | Communicate with Laboratory PM as needed via phone or e-mail. |
| Nonconformances (field and/or laboratory) | CH2M HILL Data Validation Coordinator | Mark Stinnett | 352.384.7180 | Communicate with CH2M HILL PM, CH2M HILL Task Manager, and Laboratory PM as needed via phone or e-mail. |
| Audit findings (field and/or laboratory) | CH2M HILL Project QA Manager | Andrea DePoy | 574.217.7035 | Communicate findings to CH2M HILL Task Manager or Laboratory PM (as appropriate); transmit final audit reports, including corrective actions (CA), to CH2M HILL PM, CH2M HILL CWCM Task Manager, CPG Project Coordinator, and CPG QA Coordinator. |
| | CPG Project Coordinator | Robert Law/ Bill Potter/ Stan Kaczmarek (de maximis, inc.) | 908.735.9315 | CPG Project Coordinator will provide final audit reports to USEPA RPM. |
| Issues potentially affecting DQOs | CH2M HILL FTL | TBD | TBD | Communicate with CH2M HILL QA Manager and CH2M HILL PM as needed, via e-mail or phone. Notification of the CPG QA Coordinator as appropriate. |

***QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathway***

| | | | | |
|---|---|---|---|---|
| | Dredging and Capping Operations Lead | TBD | TBD | |
| | ddms Data Management Task Manager | Mark Kill | 651.842.4232 | |
| | CH2M HILL Project Chemist | Mark Stinnett | 352.384.7180 | |
| | CH2M HILL Water Quality Monitoring Task Manager | Jennifer Wilkie | 312.873.9795<br>Cell 224.659.9101 | Communicate with CH2M HILL QA Manager and CH2M HILL PM as needed, via e-mail or phone. Notification of the CPG QA Coordinator as appropriate.<br>Significant work plan modifications will be reported to USEPA in writing prior to implementation. |
| Water sample collection task implementation, including sampling, analysis, and reporting | CH2M HILL FTL | Andrew Watson | 973.316.3553 | Communicate with CH2M HILL Task Manager as needed, via email or phone. |
| Project status and issues (internal) | CH2M HILL Project Manager | Roger McCready | 937.220.2961 | Communicate with CPG Project Coordinator, as needed, via email or phone, and submit monthly progress reports. |
| Project status and issues (external) | CPG Coordinating Counsel | William Hyatt / Dawn Monsen (K&L Gates) | 973.848.4045 or 4148 | In the event the CPG Project Coordinator is unavailable for communication with USEPA, the CH2M HILL PM will notify the Coordinating Counsel prior to contacting USEPA. |
| | CPG Project Coordinator | Robert Law/ Bill Potter/ Stan Kaczmarek (de maximis, inc.) | 908.735.9315 | Communicate with USEPA RPM as needed via e-mail or phone. |
| Quality status and issues | CPG QA Coordinator | Polly Newbold (ddms) | 908.479.1975 | Communicate with CPG Project Coordinator as needed via email or telephone |

***QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathway***

| | | | | |
|---|---|---|---|---|
| Data management | ddms Data Management Task Manager | Mark Kill | 651.842.4232 | Communicate with the Data Management Task Manager via email; transmit final field locations and sample collection information daily. |
| | Laboratory PMs | See Worksheet #30 | See Worksheet #30 | Maintain comprehensive project technical database, communicate with CH2M HILL Task Manager to receive data; communicate with Laboratory PM(s) to receive analytical result data, communicate with CH2M HILL Task Manager to provide data for review; and provide data deliverables to USEPA. |
| Stop Work (technical non-compliance) | CH2M HILL Field team, Subcontractors, Project QA Manager, Project Chemists, and Data Management Task Manager | | | Any personnel believing that a work stoppage is necessary shall first verbally notify the CH2M HILL Task Manager or the CH2M HILL PM, who will in turn verbally notify de maximis, inc. and/or CH2M HILL QA Manager, if necessary. Given the potential significance of such communications, this will occur as quickly as possible. |

***QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table***

| Name | Title | Organizational Affiliation | Responsibilities | Education and Experience Qualifications |
|---|---|---|---|---|
| Stan Kaczmarek | Field Coordinator for RM 10.9 Removal Action (Lead); CPG Project Coordinator (Alternate) | de maximis, inc. | Overall responsibility to coordinate all design, investigation, mobilization, construction and demobilization activities associated with the River Mile 10.9 Removal Action. Primary Point of Contact for the RM 10.9 Removal Action with the USEPA, its oversight contractor and the LPRSA Partner Agencies. Promote safe and proper execution of all field tasks. Periodically review and ensure contractors are implementing the approved design and enforcing project quality with their subcontractors. Also serves as back up for the Lead CPG Project Coordinator. | MS, Environmental Engineering, BS, Biological Sciences, 35 years experience |
| Robert Law | CPG Project Coordinator (Lead); Field Coordinator for RM 10.9 Removal Action (Alternate) | de maximis, Inc. | Overall responsibility for the safe and proper execution of task. Be available to discuss and review technical and other issues that may arise during work. Periodically review and audit work to ensure that work plan, project quality assurance/quality control (QA/QC), and Health and Safety (H&S) including both boating and hazardous materials worker safety procedures are being followed. All deviations from approved project plans will be discussed with and approved by the CPG Project Coordinator. Primary point of contact with the USEPA, its oversight contractor and the LPRSA Partner Agencies. Also serves as back up Field Coordinator for the RM 10.9 Removal Action. | PhD, Geology, 30 years experience |

***QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table***

| | | | | |
|---|---|---|---|---|
| Willard Potter | CPG Project Coordinator (Alternate); Field Coordinator for RM 10.9 Removal Action (Alternate) | de maximis, Inc. | Serves as back up for the Lead CPG Project Coordinator. Responsible for the safe and proper execution of task. Be available to discuss and review technical and other issues that may arise during work. Periodically review and audit work to ensure that work plan, project QA/QC, and H&S including both boating and hazardous materials worker safety procedures are being followed. All deviations from approved project plans will be discussed with and approved by the CPG Project Coordinator. Primary point of contact with the USEPA, its oversight contractor and the LPRSA Partner Agencies. Also serves as back up Field Coordinator for the RM 10.9 Removal Action. | BS, Chemical Engineering, 42 years experience |
| Roger McCready | Project Manager | CH2M HILL | Overall responsibility for technical oversight of Removal Action tasks in accordance with SOW requirements including technical, financial, and scheduling. Primary point of contact for CH2M HILL with CPG Project Coordinator. | MS and BS, Geology, 24 years experience |
| James Brinkman | Design Manager | CH2M HILL | Responsible for technical oversight of Removal Action tasks in accordance with SOW requirements including technical, financial, and scheduling. | MS and BS, Chemical Engineering, over 25 years experience |
| Jennifer Wilkie | Task Manager | CH2M HILL | Responsible for the execution and completion of the scope of work identified in this addendum under the RM 10.9 Characterization program, including procurement of subcontractors, review of task deliverables, and serving as the focus for coordination of all field and laboratory tasks. The CH2M HILL Task Manager will keep the CH2M HILL PM apprised of the status of the task; as well communicate any issues with the schedule, budget, or achievement of the task objectives. | PhD, Civil and Environmental Engineering,<br>MS and BS, Chemical Engineering,<br>BS Biomedical Engineering, over 15 years experience |

***QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table***

| | | | | |
|---|---|---|---|---|
| Andrea DePoy | Project QA Manager | CH2M HILL | Responsible for reviewing and approving QA procedures, ensuring that planned QA assessments (e.g., data validation) are conducted according to this QAPP Addendum and reporting on the adequacy of the QA Program to the CH2M HILL PM. | B.S.E., Geo-Environmental Engineering, 14 years experience |
| Jeffrey Hilgaertner | Regional EHS Manager | CH2M HILL | Responsible for ensuring that the objectives of CH2M HILL's Health and Safety Program are met and for monitoring task activities for conformance to the HASP. | BA, Business Management, over 20 years experience |
| Mark Stinnett | Project Chemist and Data Validation Coordinator | CH2M HILL | Responsible for laboratory procurement and monitoring of progress and will be the primary point of contact with the laboratories. The Project Chemist will also be responsible for communicating any issues that could affect achievement of the DQOs to the CH2M HILL Task Manager and the CH2M HILL Project QA Manager.<br>Responsible for managing the validation task, including ensuring that validation is conducted and documented according to the requirements of this QAPP, and interacting with the laboratories to resolve any issues. | BS, Chemistry, 28 years experience |
| Andrew Watson | CH2M HILL FTL | CH2M HILL | Responsible for implementing field sampling activities in accordance with the approved plans QAPP, HASP and pertinent SOPs. Primary responsibilities will include directing activities on site, monitoring subcontractor performance in the field, reviewing field records, and communicating daily with the CH2M HILL PM regarding status, quality issues, or delays. | MS, Environmental Engineering<br>BS, Environmental Systems Engineering, 6 years experience |
| Mark Kill | Data Management Task Manager | ddms, inc. | Responsible for data management for project, Including overall responsibility for database quality and structure, including graphical representation of data. | BA, Geography, 13 years experience |
| TBD | Laboratory Data Validation | Laboratory Data Consultants (LDC) | Responsible for independent validation of laboratory data | |

***QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table***

| | | | | |
|---|---|---|---|---|
| TBD | Dredging and Capping Operations Lead | Great Lakes Dredge and Dock Company | Responsible for dredging and capping operation, providing crew and equipment. Acts as the primary point of contact between CH2M HILL FTL and Task Manager and work crew. | |
| Ken Cadmus | Vessel Subcontractor Lead | OSI | Responsible for vessel operation, providing crew and equipment. Acts as the primary point of contact between CH2M HILL FTL and CWCM Task Manager and vessel crew. | MS, Civil Engineering, 16 years experience |
| John Reynolds | Laboratory PM | Test America | Acts as the primary point of contact at Test America facilities for the CH2M HILL Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues. Coordinates communication for all Test America network laboratories. | BS, Biology, 16 years experience |
| Lynda Huckestein | Laboratory PM | Columbia Analytical Services (CAS) | Acts as the primary point of contact at CAS facilities for the CH2M HILL Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues. Coordinates communication for all CAS network laboratories. | BS, Microbiology, 22 years experience |
| Misty Kennard-Mayer | Laboratory PM | Brooks Rand, LLC | Acts as the primary point of contact at Brooks Rand, LLC for the CH2M HILL Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues. | BS, Environmental Science, 7 years experience |
| Todd Vilen | Laboratory PM | Analytical Perspectives | Acts as the primary point of contact at Analytical Perspectives for the CH2M HILL Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues. | BA, Chemistry, BS, Aquatic Biology, 24 years experience |

***QAPP Worksheet #8 (UFP-QAPP Manual Section 2.4.3) Special Personnel Training Requirements Table***

| Project Function | Specialized Training by Title or Description of Course | Training Provider | Training Date | Personnel/Groups Receiving Training | Personnel Titles/ Organizational Affiliation | Location of Training Records/Certificates |
|---|---|---|---|---|---|---|
| FTL | 40 hour Hazardous Waste Operations and Emergency Response (HAZWOPER) | CH2M HILL | Various | TBD | FTL/CH2M HILL | CH2M HILL |
| | HAZWOPER 8-hr Refresher | CH2M HILL | within 12 months | | | |
| | Hazmat awareness | CH2M HILL | Various | | | |
| | First Aid/CPR | CH2M HILL | Within 24 months | | | |
| Field Personnel | 40 hour HAZWOPER | CH2M HILL | Various | Various | Various/ CH2M HILL | CH2M HILL |
| | HAZWOPER 8-hr Refresher | CH2M HILL | within 12 months | | | |
| | Hazmat awareness | CH2M HILL | Various | | | |
| Sampling Vessel Captain | 40 hour HAZWOPER | Varies | Various | Various Captains | OSI | OSI |
| | HAZWOPER 8-hr Refresher | Varies | within 12 mo | | | |
| | U.S. Coast Guard license | U.S. Coast Guard | Various | | | |
| | First Aid/CPR | Varies | within 24 mo | | | |
| Dredging and Capping Operations Lead | 40 hour HAZWOPER | Varies | Various | TBD | Dredging and Capping Operations Lead/ Great Lakes Dredge and Dock Company | Great Lakes Dredge and Dock Company |
| | HAZWOPER 8-hr Refresher | Varies | within 12 months | | | |
| | U.S. Coast Guard license | U.S. Coast Guard | Various | | | |

***QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet***

| | |
|---|---|
| **Project Name: Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection Addendum A** - Water Quality Monitoring for the River Mile 10.9 Removal Action<br>**Projected Date(s) of Sampling: June 2013 – November 2013**<br>**Project Manager: Roger McCready** | **Site Name : Diamond Alkali OU 2 - LPRRP RI/FS**<br>**Site Location: LPRSA; RM 10.9** |

**Date of Session: 23 May 2013**
**Scoping Session Purpose**: Discuss USEPA and NJDEP comments on the proposed RM 10.9 Water Quality Monitoring Plan.

| Name | Affiliation | Phone # | E-mail Address | Project Role |
|---|---|---|---|---|
| Stephanie Vaughn | USEPA | 212.637.3914 | Vaughn.Stephanie@epamail.epa.gov | Remedial Project Manager |
| Elizabeth Buckrucker | USACE | 816.389.3581 | Elizabeth.A.Buckrucker@usace.army. | USACE Project Manager |
| Anne Hayton | NJDEP | 609-984-9772 | Anne.Hayton@dep.state.nj.us | Technical Coordinator (SRP) |
| Joel A. Pecchioli | NJDEP | 609-633-2200 | Joel.Percchioli@dep.state.nj.us | Research Scientist I (SRP/ODST) |
| Jay Nickerson | NJDEP | 609-633-1448 | Jay.Nickerson@dep.state.nj.us | LPR Case Manager (SRP/BCM) |
| Scott Kirschner | CDM-Smith | 732.225.7000 | KirchnerSF@cdmsmith.com | USEPA Technical Consultant |
| Sharon Budney | CDM-Smith | 732.225.7000 | BudneySL@cdmsmith.com | USEPA Technical Consultant |
| Frank Tsang | CDM-Smith | 212.377.4056 | TsangC@cdmsmith.com | USEPA Technical Consultant |
| Deborah Beck | CDM-Smith | 617.452.6277 | BeckDF@cdmsmith.com | USEPA Technical Consultant |
| Todd King | CDM-Smith | 313.230.5648 | KingTW@cdmsmith.com | USEPA Technical Consultant |
| William Potter | de maximis, inc. | 908.735.9315 | Otto@demaximis.com | CPG Project Coordinator |
| Rob Law | de maximis, inc. | 908.735.9315 | RLaw@demaximis.com | CPG Project Coordinator |
| Stan Kaczmarek | de maximis, inc. | 908.735.9315 | StanK@demaximis.com | CPG Project Coordinator |
| Roger McCready | CH2M HILL | 937.220.2961 | Roger.McCready@ch2m.com | CPG Technical Consultant |
| James Brinkman | CH2M HILL | 617.523.2002 | James.Brinkman@ch2m.com | CPG Technical Consultant |
| Jennifer Wilkie | CH2M HILL | 312.873.9795 | Jennifer.Wilkie@ch2m.com | CPG Technical Consultant |

Comments/Decisions: During this call USEPA and NJDEP comments on the proposed RM 10.9 Water Quality Monitoring Plan were discussed. Points of discussion relevant to this QAPP Addendum A included the following:

- Additional pre-dredge monitoring and sampling: Agency participants indicated that the additional sampling they are recommending will allow them to determine optimal placement of the monitoring buoys during dredge operations and will be useful to inform future dredging actions. CPG highlighted the extensive amount of chemical and SSC data as well of several months of turbidity samples collected under previous water column monitoring studies in the vicinity of RM 10.2 that were consulted prior to recommending its monitoring plan, and that the additional samples that were requested are not likely to modify those conclusions.
- Lab analysis using 2 L samples for dioxin/furans: Agency participants indicated they wanted higher volume to decrease detection limits and lower the occurrence of J values. CPG responded that if the purpose is to determine if dredging increases the release of dioxin, then a larger volume is not necessary.
- Synoptic sampling: Agency participants indicated that for purposes of the Removal Action, synoptic sampling does not require sampling at multiple stations at the exact same time, but requested that

***QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet***

sampling from the multiple stations be conducted in reasonably close time frames. CPG suggested sampling within the same tide cycle for the synoptic sampling events; Agency participants agreed.

Upon completion of the discussion, the agency participants requested the following information, which was provided by the CPG in a followup technical memorandum and email to EPA dated May 28, 2013:

- Additional information on whether or not 2L sample volumes for dioxin/furans can be accommodated
- Turbidity data for June and July 2010 at RM 10.2, showing how it regularly exceeds 50 NTU
- River velocity data during summer month flows to help guide placement of the turbidity buoys

A revised Surface Water Quality Monitoring Plan was provided to the CPG by USEPA on May 31, 2013.

***QAPP Worksheet #10 (UFP-QAPP Manual Section 2.5.2) Problem Definition***

**The problem to be addressed by the project:**

The RM 10.9 Removal Action operations (i.e., dredging and capping) may suspend sediments into the water column and may be measureable in the immediate and downstream river environment. This water quality monitoring program will identify exceedance(s) of trigger levels and will facilitate response and management of such events, including investigation and mitigation measures. Data are needed to verify the existing turbidity-TSS-COPC correlations and determine any modifications to the current water quality monitoring plan.

***QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements***

| |
|---|
| **Who will use the data?**<br><br>CPG, CH2M HILL, and USEPA will use these data for water quality monitoring during the RM 10.9 Removal Action. |
| **What will the data be used for?**<br><br>The data will be used for the following purposes:<br><br>• Monitor the water quality outside the silt curtains for increased resuspension during dredging operations<br>• Quantify select COPC concentrations in the water column during dredging operations<br>• Adjust operations as needed to achieve desired water quality during dredging |

***QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements***

Turbidity data from fixed turbidity monitors will be collected in addition to surface water grab and composite samples, which will be analyzed for a range of constituents, including:

- PCDDs/PCDFs
- Total PCB Congeners (PCB)
- Low-Level Mercury (total and dissolved)
- Particulate Organic Carbon (POC)
- Dissolved Organic Carbon (DOC)
- Suspended Solids Concentration (SSC) [Total Suspended Solids]

The following additional information will be recorded in the water quality database and considered as necessary in the evaluation of data:

- Date, time and location of sampling;
- Person who collected the sample;
- Tidal information;
- Local wind speed and direction;
- Rainfall; and
- Other non-project river activities.

**How "good" do the data need to be in order to support the environmental decision?**

- The data need to meet project action limits (PALs)) presented in Worksheet #15.
- The data need to be collected and analyzed in conformance with various USEPA Region 2 quality assurance guidance and manuals (http://www.epa.gov/region2/qa/documents.htm).

**How much data are needed (number of samples for each analytical group, matrix, and concentration)?**

To verify and refine the turbidity-TSS-COPC correlations, the baseline monitoring will include collection of grab, transect, and composite samples as summarized in Worksheet #20.

***QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements***

**Where, when, and how should the data be collected/generated?**

Four stationary buoys to monitor turbidity were deployed on May 30-31, 2013 upstream and downstream of the RM 10.9 Removal Area to establish ambient (non-dredging) baseline conditions and to measure turbidity during dredging and capping operations. In addition, one mobile buoy will be used within the Removal Area to measure turbidity during dredging and capping operations. The locations of the five buoys are shown in Figure 1 and summarized below:

- Fixed Turbidity Buoy #1: Downstream "baseline" location at RM 10.2, approximately 0.5 miles (2,650 ft) downstream of the Removal Area's southern perimeter boundary
- Fixed Turbidity Buoy #2: Downstream location approximately 200 ft downstream of the RM 10.9 Removal Area's southern perimeter boundary
- Fixed Turbidity Buoy #3: Upstream location approximately 200 ft upstream of the RM 10.9 Removal Area's northern perimeter boundary
- Fixed Turbidity Buoy #4: Upstream "baseline" location at RM 11.7, approximately 0.5 miles (2,650 ft) upstream of the Removal Area's northern perimeter boundary
- Mobile Turbidity Buoy #5: This mobile operational buoy will be moved as needed to monitor turbidity within the Removal Area

At each buoy location, the turbidity monitors were placed at the approximate midpoint of the water column depth as measured at low tide (Buoy #1 – 5 ft below water surface, Buoy #2 – 5 ft, Buoy #3 – 5.5 ft, and Buoy #4 – 7.0 ft). The farthest downstream and upstream monitoring sites (Buoys #1 and #4, respectively) are intended to reflect the ambient conditions of the river (depending on tidal and river stage conditions) and were placed such that they would not be affected by the dredging and capping operations. The monitoring sites adjacent to the Removal Area (Buoys #2 and #3) are intended to reflect conditions due to the dredging and capping operations. The fifth mobile monitoring location (Buoy #5) is intended to provide operational early detection of elevated turbidity levels and allow the project to make adjustments such that the trigger level is not exceeded. Data will be collected to characterize water quality over different tide cycles.

**Who will collect and generate the data?**

CH2M HILL and its subcontractors, working on behalf of the CPG, will provide the field sampling coordination and field personnel required to conduct the water quality monitoring and will also provide laboratory coordination and support.

***QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements***

**How will the data be reported?**

The data recording and notification system will involve the continuous downloading of turbidity results via telemetry to a central database. These results will then be uploaded to a website which may be viewed by authorized users. In the event that an exceedance of the trigger value is detected, or when equipment failure may be imminent (e.g. low battery), an alert is sent via SMS to the environmental team for actioning.

Samples which are collected will be delivered to the laboratories on the same day where feasible, in accordance with the QAPP. An expedited turnaround time will be requested from the laboratories at the time of sample delivery, however, given the many external dependencies and inability of the laboratory to commit to a minimum turnaround period on results, this period cannot be guaranteed and will be subject to continual review. Upon validation, the analytical results will be entered into the water quality database as specified by data submission requirements of the LPRSA RI/FS.

Turbidity measurements above the action value for turbidity whether attributable to the RM 10.9 Removal Action activities or not, will be reported to USEPA within two working days of the results becoming known. This reporting will also include the management (response) measures taken at the time and possible cause(s) when RM 10.9 Removal Action activities were not found to have contributed to the turbidity.

**How will the data be archived?**

Electronic data will be archived by ddms.

***QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks***

**Sampling Tasks:** The key sampling tasks are summarized below and presented in detail in the *RM 10.9 Water Quality Monitoring Plan*:

- Baseline Turbidity and TSS Monitoring (pre-dredging, June 2013): Correlations for turbidity, TSS, and COPCs will be established for the RM 10.9 Removal Action using both historical and project specific data. The baseline monitoring event will include surface water monitoring of turbidity (NTU) every 15 minutes for 30 days and collection of TSS samples over a 10-day period to verify and refine the historical turbidity–TSS correlation so that the real-time turbidity monitors can be used as the initial resuspension indicator.

  TSS samples will be collected for 10-days, targeting 3 different tidal periods (ebb, slack [high or low], and flood) each day. These samples will be collected at the four fixed buoy locations from two depths, surface (1 ft below water surface) and mid-depth (mid-point of the water column). Surface water grab samples will be collected along transects at each of the four fixed buoy locations, 3 locations per buoy (west, center, and east channel) and 2 depths (surface and mid-depth) to characterize TSS, particulate organic carbon (POC), dissolved organic carbon (DOC) and turbidity. Composite samples (comprising aliquots from the six transect locations) will also be collected for analysis of select COPCs (PCDDs/PCDFs, total PCB congeners, and mercury), POC, DOC, and TSS.

  In addition to verifying site-specific correlations, the baseline data will be used to identify any needed revisions to the current water quality monitoring program.

- Initial Dredging Monitoring (first 48 hours, July 2013): The turbidity–TSS correlation obtained from the baseline monitoring will be the starting point for the water quality monitoring program. This correlation will be updated as required during the initial dredging operations. During the first 48 hours of dredging, TSS samples will be collected at each of the four fixed buoy locations every 2 hours at surface and mid-depth over an 8-hour period each day. In addition, one composite sample (comprising individual samples collected every 2 hours) will be collected daily at each of the four fixed buoys for analysis of select COPCs (PCDDs/PCDFs, total PCB congeners, and mercury), POC, DOC, and TSS.

  During this initial phase of monitoring, a two-person crew in a small vessel (e.g., a Jon boat) will monitor the for the presence of any visible turbidity plumes downstream of dredging activities using the same type of turbidity monitor used at the four fixed buoy locations. If a plume is observed, TSS samples will be collected from mid-depth. Sampling will start at the dredge and continue at fixed intervals in the direction of current flow within the center of the visible suspended solid plume until the downstream point is reached where turbidity levels return to approximately ambient levels. Surface water TSS sample/turbidity monitoring locations will be surveyed via GPS and recorded.

- Resuspension Monitoring: Once established, the correlation curve will be used to estimate the TSS concentration from the measured turbidity value, and turbidity will be measured continually during dredging operations at the five monitoring locations described earlier. Weekly synoptic

***QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks***

(within same tidal cycle) transect sampling will also be conducted at each of the for fixed buoy locations (surface and mid-depth) for analysis of TSS, POC, and DOC in addition to a weekly composite sample to characterize select COPCs (PCDDs/PCDFs, total PCB congeners, and mercury), POC, DOC, and TSS.

If a turbidity plume is observed, TSS samples will be collected as discussed in the Initial Dredging Monitoring task.

- Event-Based COPC Monitoring (exceedance of Turbidity Action Level): The purpose of this sampling is to collect surface waters if the Turbidity Action Level is exceeded. Sampling locations will be determined real-time based on the turbidity distribution pattern among the four fixed buoy locations. Samples will be analyzed for select COPCs (PCDDs/PCDFs, total PCB congeners, and mercury), POC, DOC, and TSS.

**Analysis Tasks:** Turbidity data from fixed turbidity monitors will be collected in addition to surface water grab and composite samples, which will be analyzed for a range of constituents, including:

- PCDDs/PCDFs
- Total PCB Congeners (PCB)
- Low-Level Mercury (total and dissolved)
- Particulate Organic Carbon (POC)
- Dissolved Organic Carbon (DOC)
- Suspended Solids Concentration (SSC) [Total Suspended Solids]

The QAPP Addendum analytical parameters will be analyzed using the same methods, and by the same laboratories, as specified in the 2012 Water Column Monitoring QAPP.

**Additional Data Collection Requirements**

The following additional information will be recorded in the water quality database and considered as necessary in the evaluation of data:

- Date, time and location of sampling;

***QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks***

- Person who collected the sample;
- Tidal information;
- Local wind speed and direction;
- Rainfall; and
- Other non-project river activities.

**Visual Observations**
Observations for the presence of a visible turbid plume and/or a visible sheen will be conducted and recorded on an hourly basis during daylight hours.

**Quality Control Tasks:** QC samples have been defined for the field and laboratory efforts. Field QC samples are summarized on Worksheet #20; laboratory QC samples are summarized on Worksheet #28.

**Data Management Tasks:** The handling of records and data are summarized on Worksheet #29.

**Documentation and Records:** Project related records (field, sample transfer/chain of custody, laboratory) are summarized on Worksheet #29.

**Assessment/Audit Tasks:** Field and laboratory audits are scheduled in accordance with Worksheet #31.

**Data Review Tasks:** Field data will be reviewed as described in Worksheet #34. Laboratories are contractually required to verify all laboratory data including electronic data deliverables (EDDs) as summarized in Worksheet #34. Data validation and usability assessments will be conducted as detailed in Worksheets #35, 36, and 37.

***QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation***

**Matrix:** Water
**Analytical Group:** PCDDs/PCDFs
**Concentration Level:** Low

| Analyte | CAS Number | PAL | Units | Project QL | Analytical Method | | Achievable Laboratory Limits | |
|---|---|---|---|---|---|---|---|---|
| | | | | | MDLs | Method QLs | EDLs* (1L) / (2L) | QLs* (1L) / (2L) |
| 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF) | 39001-02-0 | 17 | pg/L | 50 | NA | 50 | 6.5 / 3.25 | 50 / 25 |
| 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD) | 3268-87-9 | 17 | pg/L | 50 | NA | 50 | 7.5 / 3.75 | 50 / 25 |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) | 67562-39-4 | 0.5 | pg/L | 25 | NA | 50 | 1.3 / 0.65 | 25 / 12.5 |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD) | 35822-46-9 | 0.5 | pg/L | 25 | NA | 50 | 3.1 / 1.5 | 25 / 12.5 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF) | 55673-89-7 | 0.5 | pg/L | 25 | NA | 50 | 2 / 1 | 25 / 12.5 |
| 1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF) | 70648-26-9 | 0.05 | pg/L | 25 | NA | 50 | 2.1 / 1.0 | 25 / 12.5 |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) | 39227-28-6 | 0.05 | pg/L | 25 | NA | 50 | 2.1 / 1.0 | 25 / 12.5 |
| 1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF) | 57117-44-9 | 0.05 | pg/L | 25 | NA | 50 | 0.96 / 0.45 | 25 / 12.5 |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) | 57653-85-7 | 0.05 | pg/L | 25 | NA | 50 | 2.2 / 1.1 | 25 / 12.5 |
| 1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF) | 72918-21-9 | 0.05 | pg/L | 25 | NA | 50 | 1.6 / 0.8 | 25 / 12.5 |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD) | 19408-74-3 | 0.05 | pg/L | 25 | NA | 50 | 2.5 / 1.25 | 25 / 12.5 |
| 1,2,3,7,8-Pentachlorodibenzofuran (PeCDF) | 57117-41-6 | 0.17 | pg/L | 25 | NA | 50 | 1.8 / 0.9 | 25 / 12.5 |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD) | 40321-76-4 | 0.005 | pg/L | 25 | NA | 50 | 1.9 / 0.9 | 25 / 12.5 |
| 2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF) | 60851-34-5 | 0.05 | pg/L | 25 | NA | 50 | 1 / 0.5 | 25 / 12.5 |
| 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) | 57117-31-4 | 0.017 | pg/L | 25 | NA | 50 | 1.6 / 0.8 | 25 / 12.5 |
| 2,3,7,8-Tetrachlorodibenzofuran (TCDF) | 51207-31-9 | 0.05 | pg/L | 5 | NA | 10 | 1.2 / 0.6 | 5 / 2.5 |

***QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation***

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) | 1746-01-6 | 0.005 | pg/L | 5 | NA | 10 | 1.2 / 0.6 | 5 / 2.5 |
| Total HpCDF | 38998-75-3 | NA | pg/L | 50 | NA | NA | NA | 50 / 25 |
| Total HpCDD | 37871-00-4 | NA | pg/L | 50 | NA | NA | NA | 50 / 25 |
| Total HxCDF | 55684-94-1 | NA | pg/L | 50 | NA | NA | NA | 50 / 25 |
| Total HxCDD | 34465-46-8 | NA | pg/L | 50 | NA | NA | NA | 50 / 25 |
| Total PeCDF | 30402-15-4 | NA | pg/L | 50 | NA | NA | NA | 50 / 25 |
| Total PeCDD | 36088-22-9 | NA | pg/L | 50 | NA | NA | NA | 50 / 25 |
| Total TCDF | 55722-27-5 | NA | pg/L | 50 | NA | NA | NA | 50 / 25 |
| Total TCDD | 41903-57-5 | NA | pg/L | 50 | NA | NA | NA | 50 / 25 |

* The one liter (1L) and two liter (2L) extraction volumes are reflected in the EDL and QL values

***QAPP Worksheet #16 (UFP-QAPP Manual Section 2.8.2) Project Sch/Timeline Table***

| Activities | Organization | Dates (MM/DD/YY) | | Deliverable | Deliverable Due Date |
|---|---|---|---|---|---|
| | | Anticipated Date(s) of Initiation | Anticipated Date of Completion | | |
| Project Status | de maximis, inc. | Monthly | Monthly | Progress report | 15th of each month |
| Planning and Development of Study Objectives | de maximis, inc. / CH2M HILL | April 2013 | June 2013 | QAPP Addendum A for Water Quality Monitoring | July 1 2013 |
| Baseline Sampling | de maximis,inc. / CH2M HILL | June 2013 | June 2013 | Laboratory-validated data to EPA weekly; Independently validated results to EPA monthly | Starting July 2013 |
| Dredging and Capping Operations | CH2M HILL and Subcontractors | July 2013 | September 2013 | Noted in monthly progress report and Remedial Action Completion Report | 15th of each month for monthly report |
| Collection of Samples During and After Dredging and Submission for Analysis | CH2M HILL | July 2013 | November 2013 | Sample submission to laboratories | At time of collection |
| Laboratory Analysis | CH2M HILL | July 2013 | November 2013 | Analytical data to CPG | 30 days after collection. |
| Laboratory Analysis | de maximis, inc. / CH2M Hill | July 2013 | November 2013 | Laboratory-validated data to EPA weekly; Independently validated results to EPA monthly | Starting July 2013 |
| Data Validation and Verification | CH2M HILL | Multiple events, ending in November 2013 | | Data validation reports (DVRs) with data delivery | Four weeks following receipt of final laboratory data |
| Preparation and Delivery of Remedial Action Completion Report and Sampling Report to USEPA | de maximis, inc. / CH2M HILL | November 2013 | January 2014 | Remedial Action Completion Report and Sampling Report | January 2014 |

***QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale***

**Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):**

The proposed sampling locations are presented in Figure 1 for this work. Sampling locations were chosen to:

- Monitor the water quality outside the silt curtains for increased resuspension during dredging operations.
- Quantify select COPC concentrations in the water column during dredging operations
- Adjust operations as needed to achieve desired water quality during dredging.

**Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations):**

The target COPCs are 2,3,7,8 TCDD, Total PCB Congeners, and mercury. While there are specific surface water effluent standards for these compounds at remediation sites, COPC sampling data cannot be collected and analysed in a suitable timeframe that will allow real-time management of dredging operations. TSS and turbidity provide suitable parameters to assess potential construction-related water quality changes, and were selected for water quality monitoring because they can be measured in real-time during the dredging/capping operations. Monitoring of COPCs will be conducted periodically. However, should an exceedance of the action level occur, additional water column sampling will be conducted outside the area of influence of the dredging/capping operations.

To verify and refine the turbidity-TSS-COPC correlations, the baseline monitoring will include collection of grab, transect, and composite samples as summarized in Worksheet #20.

Four stationary buoys to monitor turbidity were installed on May 30-31, 2013 upstream and downstream of the RM 10.9 Removal Area to establish average non-dredging baseline conditions and to measure turbidity during dredging and capping operations. In addition, one mobile buoy will be used within the Removal Area to measure turbidity during dredging and capping operations. The locations of the five buoys are shown in Figure 1 and summarized below:

- Fixed Turbidity Buoy #1: Downstream “baseline” location at RM 10.2, approximately 0.5 miles (2,650 ft) downstream of the Removal Area’s southern perimeter boundary

***QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale***

- Fixed Turbidity Buoy #2: Downstream location approximately 200 ft downstream of the RM 10.9 Removal Area's southern perimeter boundary
- Fixed Turbidity Buoy #3: Upstream location approximately 200 ft upstream of the RM 10.9 Removal Area's northern perimeter boundary
- Fixed Turbidity Buoy #4: Upstream "baseline" location at RM 11.7, approximately 0.5 miles (2,650 ft) upstream of the Removal Area's northern perimeter boundary
- Mobile Turbidity Buoy #5: This mobile operational buoy will be moved as needed to monitor turbidity within the Removal Area

At each buoy location, the turbidity monitors were placed at the approximate midpoint of the water column depth as measured at low tide (Buoy #1 – 5 ft below water surface, Buoy #2 – 5 ft, Buoy #3 – 5.5 ft, and Buoy #4 – 7.0 ft). The farthest downstream and upstream monitoring sites (Buoys #1 and #4, respectively) are intended to reflect the ambient conditions of the river (depending on tidal and river stage conditions) and were placed such that they would not be affected by the dredging and capping operations. The monitoring sites adjacent to the Removal Area (Buoys #2 and #3) are intended to reflect conditions due to the dredging and capping operations. The fifth mobile monitoring location (Buoy #5) is intended to provide operational early detection of elevated turbidity levels and allow the project to make adjustments such that the trigger level is not exceeded. Data will be collected to characterize water quality over different tide cycles.

***QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table***

| Sampling Location | Matrix | Depth Intervals | Analyses | Number of Samples per Depth Interval: Number per Flow or Tidal Stage | Sampling SOP Reference | Rationale for Sampling Location |
|---|---|---|---|---|---|---|
| Fixed Turbidity Buoy #1 | Water | Two:<br>1 ft below surface<br>Mid-depth | PCDDs/PCDFs, total PCB congeners, mercury, POC, DOC, and TSS | Number of Samples Varies Depending on Task:<br><br>Slack (High and Low)<br>Ebb Tide<br>Flood Tide | LPR-FI-04<br>LPR-FI-05<br>LPR-FI-06 | Downstream "baseline" location at RM 10.2, approximately 0.5 miles (2,650 ft) downstream of the Removal Area's southern perimeter boundary. Intended to reflect the ambient conditions of the river (depending on tidal and river stage conditions) and were placed such that they would not be affected by the dredging and capping operations |
| Fixed Turbidity Buoy #2 | | | | | | Downstream location approximately 200 ft downstream of the RM 10.9 Removal Area's southern perimeter boundary. Intended to reflect conditions due to the dredging and capping operations |
| Fixed Turbidity Buoy #3 | | | | | | Upstream location approximately 200 ft upstream of the RM 10.9 Removal Area's northern perimeter boundary. Intended to reflect conditions due to the dredging and capping operations |
| Fixed Turbidity Buoy #4 | | | | | | Upstream "baseline" location at RM 11.7, approximately 0.5 miles (2,650 ft) upstream of the Removal Area's northern perimeter boundary. Intended to reflect the ambient conditions of the river (depending on tidal and river stage conditions) and were placed such that they would not be affected by the dredging and capping operations |

***QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) Field Quality Control Sample Summary Table***

Baseline Turbidity and TSS Monitoring (grab samples)

| Matrix | Analytical Group | Conc. Level | Analytical and Preparation SOP Reference[a] | No. Samples | No. of Duplicates | No. of MS/MSD Sets | Total No. of Samples to Lab |
|---|---|---|---|---|---|---|---|
| Water | SSC | Low | C-17 | 240 | 12 | 0 | 252 |

Baseline Turbidity and TSS Monitoring (transects and composites)

| Matrix | Analytical Group | Conc. Level | Analytical and Preparation SOP Reference[a] | No. Samples | No. of Duplicates | No. of MS/MSD Sets | Total No. of Samples to Lab |
|---|---|---|---|---|---|---|---|
| Water | PCDDs/PCDFs | Low | A-1 | 10 | 1 | 1 | 12 |
| Water | PCBs (Homologs and Congeners) | Low | T-5, T-6 | 10 | 1 | 1 | 12 |
| Water | Low-Level Mercury (total and dissolved) | Low | B-1 | 10 | 1 | 1 | 12 |
| Water | DOC, POC | Low | C-13 | 70 | 4 | 0 | 74 |
| Water | SSC | Low | C-17 | 70 | 4 | 0 | 74 |

Initial Dredging Monitoring (first 48 hours)

| Matrix | Analytical Group | Conc. Level | Analytical and Preparation SOP Reference[a] | No. Samples | No. of Duplicates | No. of MS/MSD Sets | Total No. of Samples to Lab |
|---|---|---|---|---|---|---|---|
| Water | PCDDs/PCDFs | Low | A-1 | 8 | 1 | 1 | 10 |
| Water | PCBs (Homologs and Congeners) | Low | T-5, T-6 | 8 | 1 | 1 | 10 |
| Water | Low-Level Mercury (total and dissolved) | Low | B-1 | 8 | 1 | 1 | 10 |

***QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) Field Quality Control Sample Summary Table***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Water | DOC, POC | Low | C-13 | 8 | 1 | 0 | 9 |
| Water | SSC | Low | C-17 | 88 | 5 | 0 | 93 |

Resuspension Monitoring (transects and composites)

| Matrix | Analytical Group | Conc. Level | Analytical and Preparation SOP Reference[a] | No. of Samples/week | No. of Duplicates | No. of MS/MSD Sets | Total No. of Samples to Lab |
|---|---|---|---|---|---|---|---|
| Water | PCDDs/PCDFs | Low | A-1 | 4 | 1 | 1 | 6 |
| Water | PCBs (Homologs and Congeners) | Low | T-5, T-6 | 4 | 1 | 1 | 6 |
| Water | Low-Level Mercury (total and dissolved) | Low | B-1 | 4 | 1 | 1 | 6 |
| Water | DOC, POC | Low | C-13 | 28 | 2 | 0 | 30 |
| Water | SSC | Low | C-17 | 28 | 2 | 0 | 30 |

a. Refer to Worksheet #23 of the 2012 Water Column Monitoring/Small Volume Chemical Data Collection QAPP for SOP title and method.

***QAPP Worksheet #21 (UFP-QAPP Manual Section 3.1.2) Project Sampling SOP References Table***

| Reference Number | Title, Revision Date and/or Number | Originating Organization | Equipment Type | Modified for Project Work? (Y/N) | Comments |
|---|---|---|---|---|---|
| LPR-FI-04 | Small Volume Surface Water Sampling/Chemical Data Collection, Rev. 3 | CH2M HILL | Peristaltic pump, trigger-activated bottle sampler | Yes. Composite samples will be collected[1] Trigger-activated bottle sampler will not be used. | 2012 Water Column Monitoring QAPP Appendix B |
| LPR-FI-05 | Water Column Profiling, Rev. 2 | CH2M HILL | Datasonde | Yes[2] | 2012 Water Column Monitoring QAPP Appendix B |

[1] The Fluorinated High Density Polyethylene carboy units to be utilized for composite sample collection purposes will undergo a two stage rinsing cycle to remove any potential contaminates that may exist in the individual containers as a result of the manufacturing process. The initial rinse cycle will consist of 1 gallon of over-the-counter distilled water used for a 3 minute agitated rinse period which is then captured as a waste water product. The second (final) rinse will follow with 2 liters of laboratory provided distilled water for a 2 minute agitated rinse. The final rinse may be captured as an equipment blank and submitted to the laboratory for analysis.

[2] The multiparameter datasonde with turbidity sensor (YSI™) will be deployed from buoys upstream and downstream of the RM 10.9 Removal Area to establish average non-dredging baseline conditions and to measuring turbidity during dredging. A Nexsens Technology SDL 500 submersible wireless telemetry data logger will provide real-time transmittal of turbidity results to a web-based central database.

***QAPP Worksheet #22 (UFP-QAPP Manual Section 3.1.2) Field Equipment Calibration, Maintenance, Testing, and Inspection Table***

| Field Equipment | Calibration Activity | Maintenance Activity | Testing Activity | Inspection Activity | Frequency | Acceptance Criteria | CA | Responsible Person | SOP Reference[1] |
|---|---|---|---|---|---|---|---|---|---|
| Nexsens Technology SDL 500 submersible wireless telemetry data logger | NA | Battery status transmitted every 15-minutes | Verification of real-time download | functionality | Daily | NA | Repair or replace | OSI | LPR-FI-05[2] |

[1] Refer to the Project Sampling SOP References table (Worksheet #21 of the 2011 Water Column Monitoring QAPP).

[2] The multiparameter datasonde with turbidity sensor (YSI™) will be deployed from buoys upstream and downstream of the RM 10.9 Removal Area to establish average non-dredging baseline conditions and to measuring turbidity during dredging. A Nexsens Technology SDL 500 submersible wireless telemetry data logger will provide real-time transmittal of turbidity results to a web-based central database.