River Mile 10.9 Removal Action

Lower Passaic River Study Area

Water Quality Monitoring Plan

Prepared for

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Acronyms and Abbreviations

2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
BMP	Best Management Practices
COPC	chemical of potential concern
dmi	de maximis, inc.
DOC	dissolved organic carbon
ft.	foot (feet)
FW	Fresh Water
GLDD	Great Lakes Dredge and Dock
GPS	global positioning system
JCMUA	Jersey City Municipal Utility Authority
LPR	Lower Passaic River
LPRSA	Lower Passaic River Study Area
m	meter
mg/L	milligrams per liter
MLW	mean low water
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NT	Nontrout Waters
NTU	Nephelometric Turbidity Units
°C	degrees Celsius
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzo-p-dioxins
PCDF	Polychlorinated Dibenzofurans
POC	particulate organic carbon
PVC	polyvinyl chloride
PWCM	Physical Water Column Monitoring
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QAPP	Quality Assurance Project Plan
Removal Action	River Mile 10.9 Removal Action
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study
RM	River Mile
SMS	simple message service
SSC	Suspended Solids Concentration
SV CWCM	Small Volume Chemical Water Column Monitoring

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TOC	total organic carbon
TSS	total suspended solids
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USEPA	United States Environmental Protection Agency
WCM	Water Quality Monitoring
WQMP	Water Quality Monitoring Program

1 Introduction

1.1 Overview

This Water Quality Monitoring Program (WQMP) prescribes appropriate management measures and monitoring for the protection of the existing water quality in the Lower Passaic River during dredging and capping operations conducted for the River Mile (RM) 10.9 Removal Action (Removal Action).

1.2 Program Objectives

The main objective of the WQMP is to identify surface water monitoring requirements and management response measures to be implemented during dredging and capping operations. The WQMP details the monitoring and associated trigger/action criteria, which if reached, will be used to initiate further investigation into the causes(s) and impacts that these works may be having on the surface water quality and to determine the appropriate management response. This response may include temporary cessation (stop work) of dredging and capping activities if the impact is found attributable to RM 10.9 activities, to allow for time to effectively resolve the matter so that water quality levels return to below-trigger criteria.

1.3 Existing Conditions

Evaluation of real-time impacts to water quality during the dredging and capping operations requires an understanding of the ambient conditions in the area prior to the Removal Action and of natural variability in the monitoring parameters. Since 2009, there have been two extensive data collection programs: the 2009-2010 Physical Water Column Monitoring (PWCM) program and the Small Volume Chemical Water Column Monitoring (SV CWCM) program, which were conducted as part of the Lower Passaic River Study Area (LPRSA) Remedial Investigation/Feasibility Study (RI/FS). The data generated from these programs include total suspended solids (TSS; also identified as suspended solids concentration [SSC]) and particulate organic carbon (POC) collected at two stations (RM 10.2 and RM 13.5) that bound the RM 10.9 Removal Area. **Attachment 1** includes summary tables for these parameters.

Samples for analysis of polychlorinated dibenzo-p-dioxins (PCDD) / polychlorinated dibenzofurans (PCDF), POC, dissolved organic carbon (DOC), mercury (total and dissolved), total polychlorinated biphenyl (PCB) congeners, and TSS were collected from RM 10.2 in 2011 to 2013 as part of the SV CWCM program (sampling events: Routine Flow 1, 2, 3, 4, and 5; Low Flow and High Flow). These data will be evaluated to further inform the WQMP for the Removal Action.

TSS and turbidity are the primary parameters that will be used to directly monitor the dredging and capping operations. The Water Column Monitoring data sets from RMs 10.2 and 13.5 will be used to evaluate how TSS, turbidity, and chemicals of potential concern (COPCs) at the site correlate; specifically the PWCM data collected in October - December 2009 and March - July 2010. The RI data set will be supplemented by results from samples collected during the RM 10.9 pre-dredge monitoring period to refine the correlations. These correlations will subsequently be used during the monitoring of the

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dredging and capping activities. Throughout the Removal Action, samples will be periodically collected to confirm (and modify if necessary) the chemical correlations.

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2 Proposed Controls

2.1 Overview

The proposed Removal Action dredging and capping operations may suspend sediments within the water column, which may be detectable in the immediate vicinity of the Removal Area Further details of the dredging and capping activities, including volumes and equipment, are provided in the River Mile 10.9 Removal Action Final Design Report, Lower Passaic River Study Area ("Final Design Report"; CH2M HILL, 2013a), which was submitted and reviewed separately by the United States Environmental Protection Agency (USEPA) and New Jersey Department of Environmental Protection (NJDEP).

This WQMP describes a program to identify conditions that have the potential to cause adverse environmental impacts based on the exceedance of trigger/action criteria, and the necessary actions to respond to and manage such events, including investigation and mitigation measures.

Dredging Best Management Practices (BMPs) will be implemented during the RM 10.9 Removal Action as described in the Final Design Report, consistent with the NJDEP Dredging Technical Manual, "The Management and Regulation of Dredging Activities and Dredge Material Disposal in New Jersey's Tidal Waters (October 1997) (*NJ Dredging Manual*), and as necessary to reduce the potential for river water quality impacts during the project, as described below.

2.2 Dredging/Capping Environmental Controls

2.2.1 Silt Curtains

As described in the Final Design Report and the Waterfront Development Permit-Equivalent Application, dredging activities will be conducted within a silt curtain/boom system to conservatively manage potential resuspension during dredging operations for the RM 10.9 Removal Action. This section summarizes the silt curtain/boom systems.

The use of silt curtains to manage resuspension during dredging is a United States Army Corps of Engineers (USACE)-recognized project management practice (USACE, 2005 and 2008) and is an accepted BMP in the *NJ Dredging Manual*. The silt curtain/ boom systems to be used are designed specifically for silt control in rivers, intercoastal waterways, bays, and harbors and will be deployed around the perimeter of the Removal Area.

Buoys will mark the perimeter of the silt curtain system. The silt curtain skirt will be long enough to direct resuspended sediment toward the river bottom, and booms will be located far enough from dredging activities that any potentially suspended materials will reach the river bottom before the current carries them beyond the boom.

2.2.1.1. Description

The silt curtain systems and locations are designed to provide residence time to allow the larger sediment particles to settle out of suspension within the area being dredged. The silt curtain systems will be flexible and adaptable to both the environmental conditions of the river and the activities

associated with dredging. These silt curtains will be constructed of polyvinyl chloride (PVC) sheeting that is weighted on the bottom and suspended from marine-quality floatation buoys. Floating, flashing marker lights designed for use with turbidity control curtains will be installed.

2.2.1.2. Installation

Great Lakes Dredge and Dock (GLDD) will establish the alignments of the silt curtain/boom systems and determine the locations of all the anchors, accounting for the capabilities of dredge plant and tidal fluctuations. The silt curtain/boom systems will be loaded onto work boats and transported to the designated area. Once on station, the silt curtain/booms will be lowered into the water and secured to the river bottom with anchors and/or tied off to the marine vessel(s). The silt curtain will be placed just above the sediment floor, avoiding contact with the bottom. After dredging of an area, the silt curtains will be removed in the reverse order of installation prior to repositioning the dredge plant.

The dredging/capping contractor will use a single full silt curtain system to enclose the dredging/ capping operations. This single silt curtain system will be used for multiple deployments as the dredging/capping operations move through the Removal Area. Currently, three deployments are planned for the silt curtain system. These deployments include the "Finger Area", an area up river of the "Jersey City Municipal Utility Authority (JCMUA) No Dredge Zone" and the area down river of the "JCMUA No Dredge Zone".

A gate will be configured within the silt curtain system to allow the dredge barge, material barge, and work boats to enter the dredge/ capping area inside the silt curtain system. The dredge and material barge will work within the silt curtain system where the site conditions allow. However, in areas where there is insufficient room or tidal fluctuations do not allow the contractor to maneuver equipment efficiently, the material barge will be positioned outside the single curtain system. When the material barge is located outside the main silt curtain system, an additional silt curtain may be used to surround the material barge. The silt curtains will be specifically designed and manufactured by an external contractor specializing in environmental sediment control.

The silt curtains will have a drop that can be adjusted to prevent the silt curtain from dragging on the river bottom. Where the water elevation is less than -3 feet (ft.) mean low water (MLW), only a floating boom will continue to the shoreline anchor in order to prevent the silt curtain fabric from dragging on the bottom. The silt curtain system will be secured in place using anchors initially spaced 50 ft. apart and will be adjusted depending on site-specific conditions.

2.2.2 Operational Controls

In addition to the silt curtain system, the following BMPs will be employed during the dredging/capping operations:

- Monitor the river velocity and suspend operations if the velocity increases above the effective velocity of a silt curtain system.
- Use an environmental clamshell bucket (closed, nearly watertight).

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- Maximize the size of the “bite” taken by the clamshell.
- Slowly withdraw the clamshell through the very shallow water column.
- Prohibit barge overflow or rinse sediment off the sides/gunwales of the barge.
- Maintain expeditious movement of the closed bucket to the receiving barge after completing a cut to reduce water leakage from the clamshell bucket into the river to the extent practicable.
- Prohibit “re-handling” or stockpiling of material on the river bottom.
- Prohibit raking for debris removal.
- Avoid grounding of marine vessels and allow water levels to rise before attempting to free grounded vessels.
- Minimize the number of trips by support vessels.
- Restrict the draft of workboats and barges.
- Restrict navigational speeds.
- Restrict the size and power of workboats.
- Prohibit any type of prop-washing.

3 Water Quality Monitoring

Dredging will be conducted such that it will minimize resuspension of dredged sediment in the Removal Area. The objectives of the dredge monitoring activities include the following:

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

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. In particular, NJAC 7:14A-12, Effluent Standards Applicable to Direct Discharges to Surface Water and Indirect Discharges to Domestic Treatment Works, and NJAC 7:14A-13, Effluent Limitations for Discharge to Surface Water Permits, have been considered for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), total PCB congeners and mercury. Since these parameters adhere to sediment, TSS and turbidity are appropriate for monitoring.

The target COPCs are PCDD/PCDF, total PCB congeners, and mercury (total and dissolved). While there are specific surface water effluent standards for these compounds at remediation sites, COPC sampling data cannot be collected and analyzed in a 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. To provide data associated with the COPCs, monitoring of COPCs will be conducted periodically throughout the Removal Action. However, should an exceedance of the action criteria occur, additional water column sampling will be conducted outside the area of influence of the dredging/capping operations.

There are no specific numeric limits for TSS or turbidity in NJAC 7:14A-12 or NJAC 7:14A-13; therefore, trigger and action criteria were established in the Final Design considering the NJAC 7:9B surface water quality criteria for FW2-NT waters. These criteria for TSS and turbidity are 40 milligrams per liter (mg/L) (maximum) and 15 nephelometric turbidity units (NTU) (30-day average), respectively. Surface water quality criteria for FW2-NT waters also sets a maximum for turbidity at 50 NTU. As indicated in Section 1.3, the water column monitoring data collected at RM 10.2 in 2009 and 2010 as part of the LPRSA RI/FS PWCM Program indicate that the average TSS concentration was 29 mg/L, with a standard deviation of 29 mg/L, and a maximum of 174 mg/L. The average turbidity was 20 NTU, with a standard deviation of 165 NTU and a maximum of 220 NTU. Because water quality in the area already regularly exceeds the state water quality criteria, trigger/action criteria for the RM 10.9 project will be based on TSS and turbidity values that are detected at concentrations above ambient conditions. Trigger and action criteria specific to the RM 10.9 Removal Action are described in Section 4 of this WQMP.

Details regarding data quality objectives and analytical methods are provided in Addendum A (CH2M HILL, 2013b) of the RI Water Column Monitoring/Small Volume Chemical Data Collection Quality Assurance Project Plan (QAPP) (AECOM, 2012).

3.1 Monitoring Overview

Turbidity monitoring has been used on other dredging projects as a real-time indicator of resuspension due to dredging and capping operations. Data collected as part of the RI PWCM at RM 10.2 provide a preliminary indication that a statistically significant correlation between turbidity and TSS likely exists. Building on these data, site-specific correlations for turbidity, TSS, and COPCs will be refined for the RM 10.9 Removal Action activities using both historical and project-specific data.

At the direction of USEPA and NJDEP, the following tasks will be performed as part of the WQMP:

1. Pre-dredge baseline suspended solids sampling (10 days)
2. Pre-dredge baseline transect sampling (3-4 days)
3. Initial dredging monitoring (First 2 weeks)
4. Weekly resuspension monitoring (during dredging activities with re-evaluation prior to capping activities)
5. Event-based sampling (as needed during dredging and capping activities)

3.2 Turbidity Monitoring Buoys

Turbidity monitoring buoys were installed May 30-31, 2013 to record real-time measurements of turbidity. These data will be used to establish average non-dredging baseline conditions, measure ambient turbidity upstream and downstream of the Removal Area, and monitor for elevated turbidity associated with the dredging and capping operations. The locations of the buoys are shown on **Figure 1** and summarized below:

- Fixed Turbidity Buoy #1: Downstream "ambient" 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 "ambient" 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 outside of the resuspension management system, silt curtains.

At each buoy location, the turbidity monitors were placed at the approximate midpoint of the water

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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 to prevent the trigger criteria from being exceeded.

3.3 Pre-Dredge Baseline Suspended Solids Sampling

The pre-dredge baseline suspended solids sampling event will include concurrent measurement of in-situ turbidity (NTU) and collection of surface water samples for laboratory analysis of TSS. The resulting data will be used to refine the historical turbidity–TSS relationship.

This pre-dredge baseline event will be conducted over 10 days, targeting three different tidal periods (ebb, slack [high or low], and flood) each day. Samples for TSS characterization 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).

Number of Samples: 4 buoy locations x 3 tidal periods x 2 depths x 10 days = 240 TSS samples and 240 corresponding field measurements of turbidity

3.4 Pre-Dredge Baseline Transect Sampling

To evaluate spatial variability, surface water grab samples will be collected along transects at each of the four fixed buoy locations. Six surface water grab samples and one composite sample will be generated from each transect. The grab sample locations will be spaced horizontally across the river at three locations (mid-channel and 50-feet off each shoreline as measured from MLW) and vertically at two depths (surface and mid-depth). Final transect locations will be determined in the field. The grab samples will be collected with concurrent measurement of in-situ turbidity and will be characterized for TSS, POC, and DOC. One composite sample will be generated from a given transect by combining equal aliquots from each of the six grab locations along the transect. The composite sample will be analyzed for PCDD/PCDF, total PCB congeners, mercury (total and dissolved), POC, DOC, and TSS.

This pre-dredge baseline event will be conducted over a 3- to 4-day period at each of the four fixed buoy locations, targeting three different tidal periods (ebb, slack [high or low], and flood). A total of 10 buoy/tide combinations were selected:

- Ebb tide: Buoys #2, #3, and #4
- Flood Tide: Buoys #1, #2, and #3
- Slack Tide: Buoys #1, #2, #3, and #4

Number of Transect Samples: 10 buoy/tide combinations x 3 locations/transect x 2 depths/transect = 60 TSS, POC, and DOC samples and 60 corresponding field measurements of turbidity

Number of Composite Samples: 10 Buoy/Tide Combinations = 10 PCDD/PCDF, total PCB congeners, mercury (total and dissolved), POC, DOC, and TSS samples

3.5 Initial Dredging Monitoring

During the first two weeks of dredging, samples will be collected at the four fixed buoy locations indicated in **Section 3.2** for analysis of TSS and COPCs**.** During week one, two days will be selected for collection of a daily composite sample to be generated at each of the four fixed buoy locations. Each composite sample will comprise aliquots collected at mid-depth at a frequency of approximately 1 – 2 hours over the dredging period for the given day. During week two, two days will be selected for collection of TSS samples. The samples will be collected from mid-depth at each of the four fixed buoy locations every 2 hours over an 8-hour period during dredging. -

In addition, during the first week of dredging monitoring, a two-person crew in a small vessel (for example, a jon boat) will monitor for the presence of a visible turbidity plume downstream of dredging activities. This boat will be equipped with the same type of turbidity monitor as used at the turbidity buoy locations. If a plume is observed, turbidity will be recorded and TSS samples will be collected from mid-depth (as measured at low tide) with sampling to start at the dredge and continue at 100-ft. intervals in the direction of current flow within the center of the visible suspended solids plume until the downstream point is reached where turbidity levels return to no more than 110 percent of current ambient levels as determined by turbidity buoys #1 and #4. Surface water TSS sample/turbidity monitoring locations will be surveyed via global positioning system (GPS) and recorded.

Number of Grab Samples: 4 buoy locations x 1 depth x 5 samples x 2 days = 40 TSS samples and 40 corresponding field measurements of turbidity

Number of Composite Samples: 4 buoy locations x 2 days = 8 PCDD/PCDF, total PCB congeners, mercury (total and dissolved), POC, DOC, and TSS samples

3.6 Weekly Resuspension Monitoring

Weekly resuspension monitoring will begin the second week of dredging. In-situ turbidity will be continuously monitored during dredging and capping operations at the five monitoring locations described in **Section 3.2**. The correlation curve generated as part of the baseline monitoring will be used to estimate TSS concentrations from the measured turbidity values. If the data collected during dredging confirm the correlations established during the baseline and initial dredging sampling, a modification will be proposed to reduce or eliminate additional sampling for this purpose. In addition, given the significant reduction in potential resuspension during capping (as compared to dredging), the need for weekly sampling during capping will be evaluated and a modification may be made to reduce the monitoring frequency.

The resuspension monitoring program includes weekly synoptic (within same tidal cycle) transect sampling at each of the four fixed buoy locations. Each transect comprises three grab sample locations spaced horizontally across the river at three locations (mid-channel and 50 ft. off each shoreline as

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measured from MLW and vertically at mid-depth. Final transect locations will be determined in the field. The transect grab samples will be collected for analysis of TSS, POC, and DOC. In addition, a weekly composite sample will be generated at each of the four transect locations by combining equal aliquots from each of the three grab locations along the transect. The composite sample will be analyzed for PCDD/PCDF, total PCB congeners, mercury (total and dissolved), POC, DOC, and TSS.

Number of Transect Samples (per week): 4 buoy locations x 3 locations/transect x 1 depths/transect = 12 TSS, POC, and DOC samples and 12 corresponding field measurements of turbidity

Number of Composite Samples (per week): 4 buoy locations = 4 PCDD/PCDF, total PCB congeners, mercury (total and dissolved), POC, DOC, and TSS samples

3.7 Sampling Overview and Data Management

3.7.1 Monitoring Frequency and Duration

Sample collection and turbidity monitoring for the RM 10.9 Removal Action will occur for the duration of the dredging/capping operations as summarized in Table 1.

Table 1 Removal Action Surface Water Monitoring Details

Monitoring Location	Type of Monitoring Point	Monitoring	Description of Location
Fixed Turbidity Buoy #1	Real time turbidity (NTU)	Continual—15 minute	Downstream "baseline" location at RM 10.2, approximately 0.5 miles (2,650 ft.) downstream of the Removal Area's southern perimeter boundary
	TSS sample collection	Baseline TSS – 240 samples Baseline transect – 60 samples Initial Monitoring- 40 samples Weekly resuspension – 12 samples per week	
	COPC Samples	Baseline transect - 10 composite samples Initial Monitoring - 8 composite samples Weekly resuspension – 4 composite samples per week	
Fixed Turbidity Buoy #2	Real time turbidity (NTU)	Continual—15 minute	Downstream location approximately 200 ft. downstream of the RM 10.9 Removal Area's southern perimeter boundary
	TSS sample collection	Baseline TSS – 240 samples Baseline transect – 60 samples Initial Monitoring- 40 samples Weekly resuspension – 12 samples per week	

	COPC samples	Baseline transect - 10 composite samples Initial Monitoring - 8 composite samples Weekly resuspension – 4 composite samples per week	
Fixed Turbidity Buoy #3	Real time turbidity (NTU)	Continual—15 minute	Upstream location approximately 200 ft. upstream of the RM 10.9 Removal Area's northern perimeter boundary
	TSS sample collection	Baseline TSS – 240 samples Baseline transect – 60 samples Initial Monitoring- 40 samples Weekly resuspension – 14 samples per week	
	COPC Samples	Baseline transect - 10 composite samples Initial Monitoring - 8 composite samples Weekly resuspension – 4 composite samples per week	
Fixed Turbidity Buoy #4	Real time turbidity (NTU)	Continual—15 minute	Upstream "baseline" location at RM 11.7, approximately 0.5 miles (2,650 ft.) upstream of the Removal Area's northern perimeter boundary
	TSS sample collection	Baseline TSS – 240 samples Baseline transect – 60 samples Initial Monitoring- 40 samples Weekly resuspension – 12 samples per week	
	COPC Samples	Baseline transect - 10 composite samples Initial Monitoring - 8 composite samples Weekly resuspension – 4 composite samples per week	
Mobile Turbidity Buoy #5	Real time turbidity (NTU) Early detection location	Continual—15 minute	This mobile operational buoy will be moved as needed to monitor turbidity within the Removal Area (will be placed approximately 50 ft. down current of silt curtain system surrounding dredging/ capping operations)

3.7.2 Data Management and Response

The data recording and notification system involves the continuous downloading of turbidity results via telemetry to a central database. These results are then uploaded to a website which may be viewed by authorized users. In the event that a trigger/ action criteria is exceeded, the field crew will initiate a response in accordance with the process outlined in **Section 4** .

Sample collection and laboratory analyses will be undertaken by appropriately qualified personnel in

accordance with the relevant standards and quality assurance/quality control (QA/QC) protocols described in Addendum A (CH2M HILL, 2013b) to the RI Small Volume Chemical Water Column Monitoring QAPP (AECOM, 2012). In addition, during each monitoring round, the necessary QA/QC sampling regime will be applied as specified in the QAPP addendum.

3.7.3 Data Evaluation

Collected samples will be delivered to the laboratories on the same day if possible, in accordance with the QAPP. TSS samples will be analyzed on an expedited turnaround time (5 days) and standard turnaround times will be requested for COPCs, POC, and DOC. Unvalidated laboratory data will be reported as soon as possible; third-party validation of the data will be completed and reported within standard turnaround timeframes.

Upon validation, the analytical results will be entered into the water quality database as specified by data submission requirements of the LPRSA RI/FS. These data will be compared to ambient water quality criteria. Subject to the persistent non-detection or non-exceedances of any water quality criteria during the WQMP, the agencies may agree in writing to amend the monitoring list.

3.7.4 Additional Data Collection

3.7.4.1. Meteorological Conditions

The following additional information will be recorded in the water quality database and are considered 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
- Other non-project river activities

3.7.4.2. Visual Observations

Where a plume or sheen is observed emanating from the silt curtain deployed around the active dredging/capping operations, specific measures will be taken to control the event, prevent further impact, and take corrective measures to prevent potential for a recurrence. The response, as detailed in **Section 4**, will include measuring turbidity in-situ and collecting samples for laboratory analyses.

5 Response

Turbidity monitoring is performed real-time at the fixed and mobile buoy locations on 15-minute intervals. The U.S. Environmental Protection Agency (EPA) has established turbidity trigger and action criteria and response procedures as discussed herein.

5.1 Trigger and Action Criteria

Turbidity values will be monitored real-time against the following trigger and action criteria:

- **Trigger Criteria** – Exceedance of ambient turbidity + 30 NTU measured continuously over a one-hour period (4 consecutive 15-minute intervals). Tide specific: Ebb = Buoy #2 (downstream) vs Buoy #4 (ambient) and Flood = Buoy #3 (downstream) vs Buoy #1 (ambient).

- **Action Criteria** – Exceedance of ambient turbidity + 30 NTU measured continuously and total turbidity greater than 50 NTU at the near field downstream buoy (Buoy #2 or #3) measured continuously over a one-hour period (4 consecutive 15-minute intervals). Tide specific (as detailed above).

5.2 Turbidity Exceedances and Initial Response

The construction manager will be notified if the measured turbidity exceeds the trigger/action criteria listed in **Section 4.1** and a management response will be initiated in accordance with **Section 4.3**. Throughout this period, the environmental representative will closely monitor subsequent turbidity measurements.

5.3 Event Response Process

If a visible plume or sheen emanating from the silt curtain around the active dredging/capping area is detected and/or an exceedance of the trigger/action criteria is recorded, the response processes described below and summarized in Figure 2 will be initiated.

5.3.1 Exceedance of Turbidity Trigger Criteria

If turbidity is measured at or above the trigger criteria specified in **Section 4.1**, the dredging/capping operator will be notified of the event and directed to evaluate the project's dredging BMPs as identified in Section 2.2.2. Should the cause of the increase be attributed to the RM 10.9 activities, then the project BMPs will be adjusted accordingly. Dredging/capping activities will not be stopped as a result of this 'trigger criteria' exceedance.

The construction manager (or delegate) will oversee the process of investigation and determination of the appropriate mitigation and other corrective measures. The proposed measures will consider the significance of the increase and the impacts, if any, that the increased turbidity may be having on the River.

Details of the increased turbidity above the trigger criteria will be documented and will include, but not

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be limited to, sampling location, time, date, tidal movements, meteorological conditions, location of dredging operations, and corrective and other measures taken in response to the event. Where relevant, the details of other in-river activities unrelated to RM 10.9 Removal Action will be noted.

5.3.2 Exceedance of Turbidity Action Criteria

If the measured turbidity is at or above the action criteria specified in Section 4.1, the dredging/capping operations will be suspended after an evaluation of site conditions lasting no longer than 30 minutes. If operations are suspended, the sampling team will be deployed to the near field downstream buoy to commence transect composite sampling (3-aliquot composite: mid-channel and 50 feet off each shoreline from mid-depth). Upon completion of sampling at the near field downstream buoy, the sampling team will proceed to the far field downstream buoy to collect a second transect composite sample. Dredging/capping will resume when the turbidity levels return to below the 'trigger criteria' of 30 NTUs above ambient conditions or dredging is determined not to be the source.

If dredging is suspended, the construction manager (or delegate) will oversee the process of investigation and determination of the appropriate mitigation and other corrective measures in consultation with onsite dmi and USEPA personnel and other relevant onsite personnel. Notification to other offsite USEPA and NJDEP personnel will be completed as provided in the Reporting section of this document.

Composite samples will be submitted for analysis (PCDD/PCDF, total PCB congeners, mercury [total and dissolved], POC, DOC, and TSS) if dredging operations are determined to be the source of the turbidity exceedance, otherwise samples will be held in the CPG field facility until further instruction is given by USEPA. Sufficient volume will be obtained for USEPA to collect a split sample. Composite samples will be collected for a maximum of three separate "action criteria" events during a given day of dredging.

Details that will be recorded in the event of an exceedence will include, but not be limited to, the sampling location, time, date, tidal movements, meteorological conditions, location of dredging operations, and the corrective and other measures taken in response to the event. Where relevant, the details of other in-river activities unrelated to RM 10.9 Removal Action will be noted.

5.4 Reporting

Turbidity measurements above the action criteria, whether attributable to the RM 10.9 Removal Action activities or not, will be reported to USEPA and NJDEP within 2 working days of the results becoming known. This reporting will also include the management (response) measures taken at the time and the likely cause where RM 10.9 Removal Action activities were not found to have contributed to the turbidity action criteria exceedance.

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6 Contingency Measures

A range of contingency measures are available to apply in response to turbidity measurements above the trigger/action criteria where found attributable to the RM 10.9 Removal Action dredging and capping activities. The implementation of any of these contingencies will be determined by the construction manager (or delegate) and the environmental representative (or delegate).

The nature and extent of the contingency measures adopted will be mindful of the regulatory compliance requirements and prevailing river conditions.

These measures may include:

- Additional river quality monitoring
- Repairing, modifying, and/or installing additional silt curtains
- Repairing, modifying, and/or installing absorbent booms
- Modifying the dredging/capping operational parameters
- Modifying the dredging/capping equipment, including bucket
- Modifying or suspending activities until river water quality is restored to below action criteria

The written information will include the following:

- A description of the incident, its cause, and any contributing factors
- The exact dates and times of non-compliance
- If not yet corrected, the length of time anticipated to correct the non-compliance
- Corrective actions taken or planned to prevent a recurrence

7 References

AECOM (2012). Quality Assurance Project Plan/Field Sampling Plan Addendum, Lower Passaic River Study Area, Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection, Revision 3. July.

CH2M HILL. 2013a. River Mile 10.9 Removal Action Final Design Report, Lower Passaic River Study Area, May 6.

CH2M HILL. 2013b. Draft 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, June 2013.

USACE (U.S. Army Corps of Engineers). 2005. Silt Curtains as a Dredging Project Management Practice. ERDC-TN-DOER-E21. Sept.

USACE (U.S. Army Corps of Engineers). 2008. Technical Guidelines for Environmental Dredging of Contaminated Sediments. Sept.

Figures

Attachments