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PHASE 1 REMEDIAL INVESTIGATION DATA USABILITY ASSESSMENT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY, NEWTOWN CREEK

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1 PHASE 1 REMEDIAL INVESTIGATION DATA USABILITY ASSESSMENT

The *Phase 1 Remedial Investigation Field Program Data Summary Report – Submittal No. 1, Phase 1 Remedial Investigation Field Program Data Summary Report – Submittal No. 2, and Phase 1 Remedial Investigation Field Program Data Summary Report – Submittal No. 3* (Phase 1 DSRs; Anchor QEA 2013a, 2013b, 2013c, respectively), available in Attachment A of Appendix Bi of the *Remedial Investigation Report* (RI Report), provide the data quality evaluation for all data collected during implementation of the Phase 1 *Remedial Investigation/Feasibility Study Work Plan* (RI/FS Work Plan; AECOM 2011) and draft *Phase 1 Remedial Investigation Work Plan Addendum* (WPA; Anchor QEA 2012a). This report provides the assessment of Phase 1 data for usability in the Remedial Investigation (RI), consistent with the approach applied to Phase 2 data. For the purposes of this report, these RI phases are referred to as Phase 1 and Phase 2 throughout the document and associated materials. The assessment follows the multistep process outlined in the *Phase 2 Quality Assurance Project Plan – Version No. 3* (Anchor QEA 2014) Worksheet No. 37: Data Usability Assessment, as follows:

- **Step 1 – Review the project's objectives and sample design**. The data needs identified to meet project objectives were established in the RI/FS Work Plan (AECOM 2011) and WPA (Anchor QEA 2012a).
- **Step 2 – Review the data verification and data validation outputs**. Data were validated per the Phase 1 *Quality Assurance Project Plan* (QAPP; Anchor QEA 2011a) requirements. The Phase 1 DSRs (Anchor QEA 2013a, 2013b, 2013c) summarize the data verification/validation procedures and the overall quality assessment based on sample collection and documentation, precision, accuracy, representativeness, comparability, sensitivity, and completeness. This report summarizes the data quality issues found during the data usability assessment.
- **Steps 3 and 4 – Verify the assumptions of the selected statistical method and implement the statistical method**. The sample design in the *Field Sampling and Analysis Plan* (FSAP; Anchor QEA 2011b) was established to statistically evaluate the nature and extent of contamination and inform the Phase 2 studies. The statistical analyses performed focused primarily on calculations of, for example, means, medians, and 95% upper confidence limits on the means, on both a Study Area-wide basis and a segment-specific basis. The number of samples collected were sufficient to

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meet the requirements of ProUCL (Version 5.0), so they are sufficient to meet work plan objectives. Where appropriate, the RI Report will provide statistical analyses of data.

- **Step 5 – Document data usability and draw conclusions**. The Phase 1 field teams adhered to the procedures in the FSAP (Anchor QEA 2011b), with the exceptions of approved field deviations (Anchor QEA 2012b, 2012c, 2012d, 2012e, 2012f). The laboratories and data validator adhered to the procedures and requirements in the Phase 1 QAPP, with the exceptions of approved QAPP deviations (Anchor QEA 2012b, 2012c, 2012d, 2012e, 2012f). Data outliers and assigned qualifiers are documented in data validation reports (DVRs; see Attachment A of Appendix Bi of the RI Report). Data usability conclusions are provided in this report. The field programs were successfully completed, so they provide sufficient data to meet the work plan objectives.

1.1 Phase 1 Completeness

As shown in Table Biii1-1, all analytical groups met completeness goals. The overall completeness of Phase 1 data was greater than 99%.

1.2 Phase 1 Data Quality Issues

Two types of data quality issues were encountered in the Phase 1 analytical data—systematic and sporadic (see Tables Biii1-2 and Biii1-3, respectively). Systematic data quality issues are defined as those that were identified either consistently across matrices or in a majority of results. They stemmed from a laboratory's inability to provide consistent or accurate data for an analytical group, method, matrix, or specific compound. Sporadic data quality issues are defined as those that were encountered in some samples, but do not appear to stem from laboratory procedure or analytical method limitations. Encountered systematic and sporadic data quality issues are discussed in the next sections.

1.2.1 Systematic Data Quality Issues

Some systematic data quality issues were encountered in Phase 1. Table Biii1-2 provides the percentage of data impacted by these issues, organized by field task (e.g., surface sediment). A description of each issue follows:

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- **Total organic carbon (TOC) and dissolved organic carbon (DOC) in water.** The matrix spike (MS) recoveries in the TOC and DOC analyses were below QAPP measurement performance criteria at the beginning of the Phase 1 program, due to matrix interference from high salinity. Once the issue was discovered by the project chemist and discussed with the laboratory project manager, the laboratory began diluting the samples prior to analysis and MS recoveries improved. Results associated with low MS recoveries are qualified as estimated or as rejected (22% of results impacted), depending on the percent recovery and validation guidance. Qualified data were deemed usable in the RI. Rejected data were not used for any purpose. Subsequent samples analyzed at a dilution had elevated quantitation limits (QLs). A different laboratory, with lower QLs, was used approximately half-way through the Phase 2 sampling (see the *Phase 2 Data Summary Report* [Appendix Bi of the RI Report]). The complete RI dataset had a sufficient number of detections to understand the range of DOC concentrations in the Study Area and to meet the overall RI data quality objectives (DQOs). Discussion of DOC results is provided in Section 4.7.2.2 of the RI Report.
- **TOC in sediment.** The initial TOC results were statistically determined to be biased low in Phase 1. After the laboratory conducted a detailed review of their standard operating procedure (SOP), they determined the cause of the issue, which was one individual chemist who over-acidified the samples, resulting in inaccurate sample weights due to the acid residue. The laboratory reanalyzed 559 of the 793 Phase 1 sediment samples using the correct procedure and obtained usable data. Archived material for the remaining 234 samples was not available for reanalysis. A detailed assessment of the issue and the results that were used is included in the *Phase 2 RI Field Program – QAPP/FSAP Deviation Memorandum No. 9* (Anchor QEA 2015), QAPP Deviation Form 9-6.
- **Low-resolution pesticides in sediments.** Various matrix interference issues were noted by the laboratory. After comparison with the high-resolution data (which were analyzed on 25% of the Phase 1 sediment samples), it was determined that several compounds exhibited low and/or high biases, based on spike recoveries (e.g., MS/matrix spike duplicate [MSD], laboratory control sample [LCS], surrogates) that were outside of measurement performance criteria listed in the QAPP. Additionally, the laboratory discovered that during the extraction step, trans-nonachlor was split

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into two fractions. Based on best professional judgment, all non-rejected pesticides data were qualified as estimated, except non-detect trans-nonachlor results, which were rejected.

- **Antimony in sediments.** The metal MS/MSD analyses conducted on the sediment samples resulted in consistent antimony recoveries below the measurement performance criteria listed in the QAPP for antimony. The U.S. Environmental Protection Agency (USEPA) preparation Method 3050B was used to digest all sediment samples for metals analyses. Further research indicated that antimony does not solubilize well in nitric acid, which is the primary acid used in the preparation method. All non-rejected sediment antimony results were qualified as estimated. Prior to Phase 2, the laboratory modified their SOP to mitigate this issue, and subsequently, the majority of the Phase 2 MS/MSD samples recovered within project control limits. For Phase 1 samples, most of the MS recoveries were low, and associated sample results may be biased low. Despite a potential low bias, 93% of Phase 1 sediment results were detected, and therefore, deemed usable in the RI.

  Phase 2 data were analyzed using the laboratory's revised preparation method, so the complete RI dataset provides an accurate assessment of antimony concentrations. Although antimony was identified as a contaminant of potential concern (COPC) using conservative screening level risk analyses in the *Baseline Human Health Risk Assessment* (BHHRA; Anchor QEA 2017), and as a contaminant of potential ecological concern (COPEC) using conservative screening level risk analyses in the draft *Baseline Ecological Risk Assessment* (BERA; Anchor QEA 2018), it was not found to be a COPC or COPEC in either assessment following more detailed and site-specific evaluations, so the data usability limitations did not impact the risk assessment.
- **Polychlorinated biphenyl (PCB) Aroclor data correction**. Surface and subsurface sediment samples and native material samples collected in Phase 1 were analyzed for PCB Aroclors by USEPA Method 8082. Twenty-five percent of the Phase 1 samples, as well as all Phase 2 samples, were analyzed for PCB congeners by USEPA Method 1668A. The Aroclor and congener datasets were combined to create a single dataset for total polychlorinated biphenyl (TPCB). As demonstrated using the paired TPCB congener and TPCB Aroclor data from the Phase 1 dataset for surface sediment, subsurface sediment, and native material, a strong correlation (coefficient of

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determination [r^2] = 0.87) exists between the two analytical methods. To create a single unified dataset, the TPCB Aroclor data were multiplied by the average ratio of TPCB congener to TPCB Aroclor concentration in these paired samples of 1.75, to provide a concentration of TPCB congeners.

1.2.2 Sporadic Data Quality Issues

Several sporadic data quality issues were found during the data validation. Most of these issues resulted in J-qualifications to indicate estimated analytical results. These issues are detailed in the DVR prepared for each laboratory data report. Data quality issues considered to be major resulted in rejected data. A summary of rejected (unusable) data organized by field task is provided in Table Biii1-3. The following is a brief description of sporadic data quality issues considered to be major encountered in each field task:

- Air
  - Nine PCB Aroclor results (3.4% of total) from one sample were rejected due to low surrogate recovery.
- Surface sediment
  - One herbicide result (0.04% of total) was rejected due to low MS recovery.
  - Fourteen volatile organic carbon (VOC) (0.1% of total) results were rejected due to low MS recoveries.
  - Thirty-eight semivolatile organic carbon (SVOC) results (0.2% of total) were rejected due to low MS, LCS, and/or continuing calibration verification (CCV) recoveries.
- Subsurface sediment
  - Ten methyl mercury results (8.1% of total) were rejected due to low MS recoveries.
  - Two mercury results (0.4% of total) were rejected due to low MS recoveries.
  - Four PCB congener results (0.02% of total) were rejected due to low MS or internal standard recoveries.
  - Seven ammonia results (1.4% of total) were rejected due to low MS recoveries.
  - Seven herbicide results (0.1% of total) were rejected due to low MS, LCS, and/or CCV recoveries.

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  - Three VOC results (0.04% of total) were rejected due to low MS recoveries.
  - Twenty-four SVOC results (0.06% of total) were rejected due to low MS, LCS, and/or CCV recoveries.
  - Eleven cyanide results (2.2% of total) were rejected due to low MS recoveries or hold time exceedances.
  - One sulfide result (0.2% of total) was rejected due to the hold time exceedance.
- Surface water
  - Three arsenic results (0.4% of total) were rejected due to low MS recoveries.
  - Two nitrate/nitrite results (0.2% of total) were rejected due to low MS recoveries.
  - Eleven pesticide results (0.1% of total) were rejected due to low surrogate and/or MS recoveries.
  - Twenty-one herbicide results (0.6% of total) were rejected due to low surrogate and/or MS recoveries.
  - Fifty-six SVOC results (0.2% of total) were rejected due to low MS, LCS, initial calibration verification, and/or CCV recoveries.

Despite these rejections, completeness goals were met for all analytical groups.

1.3 Phase 1 Data Usability and Limitations Assessment

Based on a review of the laboratory reports, DVRs, and overall congruity of the data, unqualified "J" (indicates an estimated value), "U" (indicates the compound was analyzed but not detected above the detection limit), and "UJ" (indicates the compound was analyzed for, but not detected above, the estimated detection limit) qualified results were considered usable. Rejected data, qualified "R," will not be used. Some data will have limited use based on professional judgment and the DQOs. Data with limited use include the following:

- **Low-resolution pesticides in sediment.** Due to matrix interferences, some compounds reported from the low-resolution pesticides method may be biased low or high. For samples that had both high-resolution and low-resolution pesticide results (25% of samples), the high-resolution data were used. For the remaining 75% of Phase 1 sediment samples, the low-resolution data were deemed usable in the RI. Phase 2 sediment samples were analyzed using only the high-resolution method, so the complete RI dataset provides an accurate assessment of pesticide concentrations.

Although pesticides were identified as COPCs using conservative screening level risk analyses in the BHHRA, and as COPECs using conservative screening level risk analyses in the draft BERA, they were not found to be a COPC or COPEC in either assessment following more detailed and site-specific evaluations, so the data usability limitations did not impact the risk assessment.

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TABLES

Table Biii1-1
Phase 1 Analytical Completeness

Matrix	Analytic Category	Count Results	Count Rejected Results	Count Non-Rejected Results	Percent Completeness	Analytical Completeness Goal
Air	Volatile Organics	1,160	0	1,160	100%	90%
Air	Semivolatile Organics	116	0	116	100%	90%
Air	PCB Aroclors	261	9	252	97%	90%
Sediment	Conventional Parameters	8,468	25	8,443	100%	90%
Sediment	Grain Size	9,690	0	9,690	100%	90%
Sediment	Metals	17,563	17	17,546	100%	90%
Sediment	Organometallic Compounds	157	10	147	94%	90%
Sediment	Volatile Organics	18,772	17	18,755	100%	90%
Sediment	Semivolatile Organics	48,126	62	48,064	100%	90%
Sediment	Polycyclic Aromatic Hydrocarbons	26,965	0	26,965	100%	90%
Sediment	Alkylated Polycyclic Aromatic Hydrocarbons	20,279	0	20,279	100%	90%
Sediment	Pesticides – Low resolution	21,054	639	20,415	97%	90%
Sediment	Pesticides – High resolution	5,510	0	5,510	100%	90%
Sediment	Herbicides	7,297	8	7,289	100%	90%
Sediment	Dioxin/Furans	3,925	0	3,925	100%	90%
Sediment	PCB Aroclors	6,570	0	6,570	100%	90%
Sediment	PCB Congeners	26,783	4	26,779	100%	90%
Sediment	n-Alkanes and Isoprenoids	26,973	0	26,973	100%	90%
Sediment	Total Petroleum Hydrocarbons	1,458	0	1,458	100%	90%
Sediment	Radionuclides	664	0	664	100%	90%
Water	Conventional Parameters	8,658	95	8,563	99%	90%
Water	Pathogens	682	0	682	100%	90%
Water	Metals	16,411	3	16,408	100%	90%
Water	Organometallic Compounds	342	0	342	100%	90%
Water	Volatile Organics	17,784	0	17,784	100%	90%
Water	Semivolatile Organics	22,586	56	22,530	100%	90%
Water	Polycyclic Aromatic Hydrocarbons	12,305	0	12,305	100%	90%
Water	Alkylated Polycyclic Aromatic Hydrocarbons	9,576	0	9,576	100%	90%
Water	Pesticides	9,918	11	9,907	100%	90%
Water	Herbicides	3,420	21	3,399	99%	90%
Water	Dioxin/Furans	2,400	0	2,400	100%	90%

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Table Biii1-1
Phase 1 Analytical Completeness

Matrix	Analytic Category	Count Results	Count Rejected Results	Count Non-Rejected Results	Percent Completeness	Analytical Completeness Goal
Water	PCB Aroclors	3,078	0	3,078	100%	90%
Water	PCB Congeners	16,328	0	16,328	100%	90%
Water	n-Alkanes and Isoprenoids	12,654	0	12,654	100%	90%
Water	Total Petroleum Hydrocarbons	684	0	684	100%	90%
All Matrices	All Analytes	388,617	977	387,640	99.7%	--

Acronym:
PCB = polychlorinated biphenyl

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Table Biii1-2
Phase 1 Systematic Data Quality Issues

Matrix	Phase 1 RI Task	Analytical Group	Data Quality Issue	Number of Results Affected	Total Number of Results	Percentage of Results Affected
Sediment	Surface Sediments	Pesticides	Accuracy – Low ICV/CCV/LCS percent recoveries; professional judgment	21,054	21,054	100%
		Conventionals – TOC[1]	Accuracy – due to laboratory sample preparation error, sample results were biased low	300	300	100%
		Metals – Antimony	Accuracy – low MS recoveries due to matrix interference	729	729	100%
Sediment	Subsurface Sediments	Pesticides	Accuracy – Low ICV/CCV/LCS percent recoveries; professional judgment	14,210	14,210	100%
		Conventionals – TOC[1]	Accuracy – due to laboratory sample preparation error, sample results were biased low	493	493	100%
		Metals – Antimony	Accuracy – low MS recoveries due to matrix interference	493	493	100%
Water	Surface Water	Conventionals – TOC/DOC	Accuracy – low MS recoveries due to matrix interference	180	806	22%

Notes:
Only Phase 1 RI tasks with systematic data quality issues are shown in this table, so the total of each matrix in this table does not necessarily add up to the matrix sum in Table Biii1-1.
1 = Initial sediment TOC results were found to have a low bias after the start of the Phase 2 program. The laboratory corrected the procedure that was causing low results and reanalyzed available Phase 1 frozen archives with the correct procedure (Anchor QEA 2015).

Acronyms:
CCV = continuing calibration verification
DOC = dissolved organic carbon
ICV = initial calibration verification
LCS = laboratory control sample
MS = matrix spike
RI = Remedial Investigation
TOC = total organic carbon

Reference:
Anchor QEA (Anchor QEA, LLC), 2015. *Phase 2 RI Field Program – QAPP/FSAP Deviation Memorandum No. 9* . Newtown Creek Remedial Investigation/Feasibility Study. September 8, 2015.

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Table Biii1-3
Phase 1 Sporadic Major Data Quality Issues

Matrix	Phase 1 RI Task	Analytical Group	Data Quality Issue	Number of Results Affected	Total Number of Results	Percentage of Results Affected
Air	Air Sampling	PCB Aroclors	Accuracy – surrogate percent recovery	9	261	3.4%
Sediment	Surface Sediment	Herbicides	Accuracy – low MS percent recovery	1	2360	0.04%
		VOCs	Accuracy – low MS percent recovery	14	13,682	0.1%
		SVOCs	Accuracy – low MS, LCS, and/or CCV percent recovery	38	18,380	0.2%
Sediment	Subsurface Sediment	Methyl mercury	Accuracy – low MS percent recovery	10	124	8.1%
		Metals – mercury	Accuracy – low MS percent recovery	2	492	0.4%
		PCB Congeners	Accuracy – low MS or internal standard percent recovery	4	21,284	0.02%
		Conventionals – ammonia	Accuracy – low MS percent recovery	7	489	1.4%
		Herbicides	Accuracy – low MS, LCS, and/or CCV percent recovery	7	4,937	0.1%
		VOCs	Accuracy – low MS percent recovery	3	7,487	0.04%
		SVOCs	Accuracy – low MS, LCS, and/or CCV percent recovery	24	38,129	0.06%
		Conventionals – cyanide	Accuracy – low MS percent recovery or excessive hold time exceedance	11	489	2.2%
		Conventionals – sulfide	Accuracy – hold time exceedance	1	489	0.2%
Water	Surface Water	Metals – arsenic	Accuracy – low MS percent recovery	3	670	0.4%
		Conventionals – nitrate/nitrite	Accuracy – low MS percent recovery	2	806	0.2%
		Pesticides	Accuracy – low surrogate and/or MS percent recovery	11	9,715	0.1%
		Herbicides	Accuracy – low surrogate and/or MS percent recovery	21	3,350	0.6%
		SVOCs	Accuracy – low MS, LCS, ICV, and/or CCV percent recovery	56	24,476	0.2%

Note:
Only Phase 1 RI tasks with sporadic major data quality issues are shown in this table, so the total of each matrix in this table does not necessarily add up to the matrix sum in Table Biii1-1.

Acronyms:
CCV = continuing calibration verification
ICV = initial calibration verification
LCS = laboratory control sample
MS = matrix spike
PCB = polychlorinated biphenyl
RI = Remedial Investigation
SVOC = semivolatile organic compound
VOC = volatile organic compound

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