Tierra Solutions, Inc.

Combined Sewer Overflow/Stormwater Outfall Investigation

Quality Assurance Project Plan

Addendum

Lower Passaic River Study Area

June 2012

Revision 1

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Analytical Method/Standard Operating Procedures (SOPs)

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L-22 Project-Specific Modifications to Lloyd Kahn to Accommodate the Determination of Total Organic Carbon on Filtered Particulates (Particulate Organic Carbon)
L-23 Project-Specific Modifications to LSM Particulate Sample Preparation (LSM Filters) Prior to Analysis of PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Semivolatile Organics, Aroclor PCBs, and Chlorinated Herbicides
L-24 Project-Specific Low Solids Mass Bulk Sample Filtration
L-26 Project-Specific Modifications to HSM Particulate Sample Preparation Prior to Analysis of Organochlorine Pesticides

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QAPP Worksheet #3
Distribution List

QAPP Recipients	Responsibility	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number [a]
Alice Yeh	Remedial Project Manager	USEPA Region 2	212-637-4427	212-637-4393	Yeh.Alice@epamail.epa.gov	1
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Meredith Hayes	Task Manager	ARCADIS U.S., Inc.	212-682-9271, ext. 39	212-682-9275	meredith.hayes@arcadis-us.com	1
TBD [b]	Field Supervisor	ARCADIS U.S., Inc.	TBD [b]	TBD [b]	TBD [b]	1
Robert Reed	Quality Assurance Officer	ARCADIS U.S., Inc.	315-671-9457	315-445-9161	rob.reed@arcadis-us.com	1
Diane Waldschmidt	Quality Assurance Coordinator	Environmental Data Services, Ltd.	412-486-6989	412-486-6429	edatas@aol.com	1
Elise Francken	Assistant Quality Assurance Coordinator	Environmental Data Services, Ltd.	412-486-6989	412-486-6429	edatas@aol.com	1
Kirk Young	Laboratory Project Manager	TestAmerica, Burlington, VT	802-660-1990	802-660-1919	kirk.young@testamericainc.com	1
Martha Maier	Laboratory Project Manager	Vista Analytical Laboratory	916-673-1520	916-673-0106	mmaier@vista-analytical.com	1
Tiffany Stilwater	Laboratory Project Manager	Brooks Rand Labs	206-753-6141	206-632-6017	tiffany@brooksrand.com	1

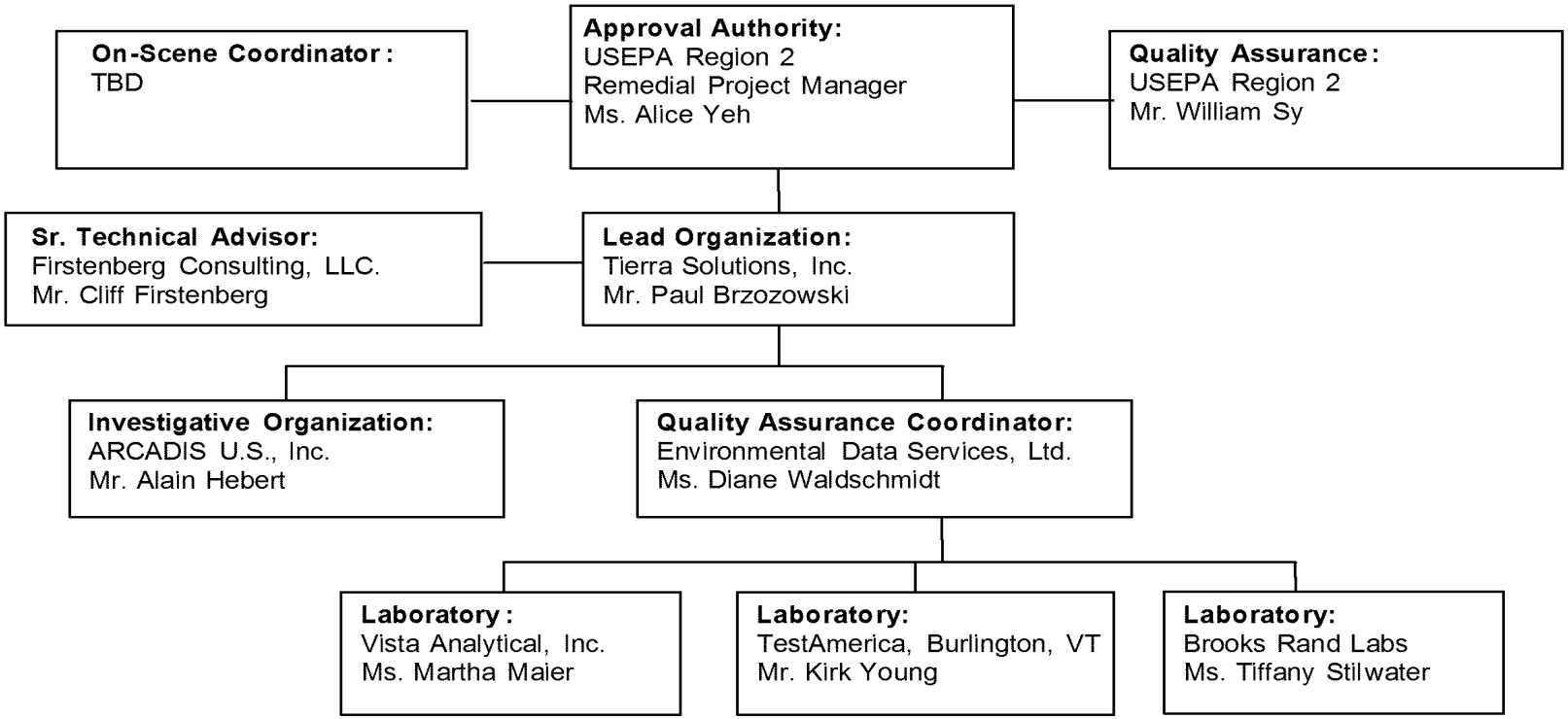
Notes:

[a] The current revision number for this Combined Sewer Outfall/Stormwater Overflow Investigation Quality Assurance Project Plan will be used in lieu of a unique document control number that is assigned to each copy.

[b] ARCADIS will provide the TBD information for the Field Supervisor prior to the start of the project.

TBD = to be determined

QAPP Worksheet #5
Project Organizational Chart



QAPP Worksheet #6
Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (e.g., Timing, Pathways)
Point of contact with U.S. Environmental Protection Agency (USEPA) Remedial Project Manager and On Scene Coordinator	Tierra Solutions, Inc. Project Coordinator	Paul Brzozowski	732-246-5851	Correspondence regarding the project will be forwarded to Alice Yeh by Paul Brzozowski.
Manage project reporting activities	ARCADIS U.S., Inc. Project Manager	Alain Hebert	609-860-0590	Alain Hebert will be ARCADIS U.S., Inc.'s liaison to Paul Brzozowski.
Manage field sample collection activities	ARCADIS U.S., Inc. Task Manager	Meredith Hayes	212-682-9271, ext. 39	Meredith Hayes will notify, via e-mail, Alain Hebert of non-conformance and suggested corrective actions within 1 business day of identification.
Daily field progress reports	ARCADIS U.S., Inc. Field Supervisor	TBD[a]	TBD[a]	Field Supervisor will e-mail daily field progress reports to Meredith Hayes and Alain Hebert.
Identification of field corrective action	ARCADIS U.S., Inc. Field Supervisor	TBD[a]	TBD[a]	Field Supervisor will notify Meredith Hayes, Alain Hebert, and Diane Waldschmidt, via e-mail, of non-conformance and suggested corrective action within 1 business day of identification.
Reporting laboratory data quality issues	TestAmerica, Burlington, VT Laboratory Project Manager	Kirk Young	802-660-1990	Quality assurance/quality control (QA/QC) issues with project field samples will be reported by Kirk Young to Diane Waldschmidt within 1 business day of identification.
Reporting laboratory data quality issues	Vista Analytical, Inc. Laboratory Project Manager	Martha Maier	916-673-1520	QA/QC issues with project field samples will be reported by Martha Maier to Diane Waldschmidt within 1 business day of identification.
Reporting laboratory data quality issues	Brooks Rand Labs Laboratory Project Manager	Tiffany Stilwater	206-753-6141	QA/QC issues with project field samples will be reported by TBD to Diane Waldschmidt within 1 business day of identification.
Field and analytical corrective actions	Environmental Data Services, Ltd. Quality Assurance Coordinator	Diane Waldschmidt	412-486-6989	Requested field or laboratory corrective action will be evaluated and documented by Diane Waldschmidt.
Release of analytical data	Environmental Data Services, Ltd. Quality Assurance Coordinator	Diane Waldschmidt	412-486-6989	Upon approval of its release by Diane Waldschmidt, final validated data will be forwarded to USEPA in an agreed upon format (e.g., compact disc).
QAPP amendments	USEPA Region 2	Alice Yeh	212-637-4427	Any changes requested by Paul Brzozowski must be approved by Alice Yeh before changes can be implemented.

Notes :

[a] ARCADIS will provide the TBD information for the Field Supervisor prior to the start of the project.

TBD = to be determined

QAPP Worksheet #7
Personnel Responsibilities and Qualifications

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Paul Brzozowski	Project Manager	Tierra Solutions, Inc.	Project Coordinator	BS Civil Engineering/25 years
Robert Romagnoli	Senior Vice President	ARCADIS U.S., inc.	Principal -in-Charge	MBA General Management, BS Civil Engineering/ 21 years
Alain Hebert	Principal Environmental Engineer	ARCADIS U.S., Inc.	Project Manager	MS Environmental Engineering/ 20 years
Charles Barnes	Technical Manager	ARCADIS U.S., Inc.	Senior Expert	BS Environmental Engineering/30 years
Meredith Hayes	Project Scientist	ARCADIS U.S., Inc.	Task Manager	MS Marine Science, BS Chemistry, BS Oceanography/ 7 years
TBD[a]	TBD[a]	ARCADIS U.S., Inc.	Senior Field Technician and Health and Safety Supervisor	TBD[a]
Diane Waldschmidt	Director	Environmental Data Services, Ltd.	Quality Assurance Coordinator	BS Chemistry/22 years
Elise Fracken	Senior Technical Specialist	Environmental Data Services, Ltd.	Qualtiy Assurance Assistant	BS Chemistry/16 years
Kirk Young	Customer Service/Project Manager	TestAmerica, Burlington, VT	Laboratory Project Manager	BS Civil Engineering/33 years
Martha Maier	Laboratory Manager	Vista Analytical, Inc.	Laboratory Project Manager	BS Chemistry/23 years
Tiffany Stilwater	Project Management Group Leader	Brooks Rand Labs	Laboratory Project Manager	BA Environmental Science/5 years

Notes :

[a] ARCADIS will provide the TBD information for the Field Supervisor prior to the start of the project.

TBD = to be determined

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	Semivolatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-1, L-17	Accuracy/Bias	**Surrogate Compounds**	**% Recovery** [d]	Surrogate Spikes	A
			Phenol-d_5	39-106		
			Bis(2-chloroethyl)ether -d_8	40-105		
			2-Chlorophenol-d_4	41-106		
			4-Methylphenol-d_8	25-111		
			Nitrobenzene-d_5	43-108		
			2-Nitrophenol-d_4	40-108		
			2,4-Dichlorophenol-d_3	37-105		
			4-Chloroaniline-d_4	1-145		
			Dimethylphthalate- d_6	47-114		
			Acenaphthylene-d_8	41-107		
			4-Nitrophenol-d_4	33-116		
			Fluorene- d_{10}	42-111		
			4,6-Dinitro-2-methylphenol-d_2	22-104		
			Anthracene-d_{10}	44-110		
			Pyrene- d_{10}	52-119		
			Benzo(a)pyrene-d_{12}	32-121		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	Volatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-1	Accuracy/Bias	**Surrogate Compounds**	**% Recovery** [d]	Surrogate Spikes	A
			Vinyl chloride-d_3	65-131		
			Chloroethane-d_5	71-131		
			1,1-Dichloroethene- d_2	55-104		
			2-Butanone-d_5	49-155		
			Chloroform-d	78-121		
			1,2-Dichloroethane-d_4	78-129		
			Benzene- d_6	77-124		
			1,2-Dichloropropane-d_6	79-124		
			Toluene-d_8	77-121		
			Trans-1,3-Dichloropropene-d_4	73-121		
			2-hexanone-d_5	28-135		
			1,1,2,2-Tetrachloroethane-d_2	73-125		
			1,2-Dichlorobenzene -d_4	80-131		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Trip Blanks [e] and Method Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	Aroclor PCBs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-1, L-25	Accuracy/Bias	**Surrogate Compound**	**% Recovery**	Surrogate Spikes	A
			Tetrachloro- m-xylene	30-150		
			Decachlorobiphenyl	30-150		
		Accuracy/Bias	**Compound**	**% Recovery**	Laboratory Control Sample	A
			Aroclor-1016	50-150		
			Aroclor-1260	50-150		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks and Instrument Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	Organochlorine Pesticides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-2, L-19	Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2	Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks and Instrument Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Accuracy/Bias	Per L-2	Initial Calibration	A
		Accuracy/Bias	Per L-2	Calibration Verification	A
		Accuracy/Bias	Per L-2	Labeled Compound Spike	A
		Accuracy/Bias	Per L-2	Labeled Internal Standards	A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	Semivolatile Organics (SIM)
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-1, L-18	Accuracy/Bias	**Surrogate Compounds**	**% Recovery**	Surrogate Spikes	A
			Naphthalenel-d_8	20-130		
			Acenaphthene-d_{10}	20-130		
			Phenanthrene-d_{10}	20-130		
			Chrysene-d_{12}	20-130		
			Perylene -d_{12}	20-130		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Trip/Equipment Blank (Continued)

Matrix	Field/Rinse/ Trip Equipment Blank
Analytical Group [a]	Metals, Mercury, Methyl mercury , and Cyanide
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-5, SOP-6	L-4, L-5, L-6, L-7	Accuracy/Bias	**Analyte**	**% Recovery**	Ongoing Precision and Recovery	A
			Aluminum	80-120		
			Antimony	79-122		
			Cadmium	84-113		
			Copper	51-145		
			Cyanide	80-120		
			Lead	72-143		
			Mercury	77-123		
			Methyl Mercury	67-133		
			Nickel	68-134		
			Selenium	59-149		
			Silver	74-119		
			Thallium	64-137		
			Zinc	46-146		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks and Instrument Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Accuracy/Bias	Per L-4, L-5, L-6		Intiial Precision and Recovery (metals only)	A
		Accuracy/Bias	Per L-4, L-5, L-6, and L-7		Initial Calibration	A
		Accuracy/Bias	Per L-4, L-5, L-6, and L-7		Calibration Verification	A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	PCDD/PCDFs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-8, L-20	Accuracy/Bias	All target compound concentrations must fall within range provided in Table 6 of L-8	Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Accuracy/Bias	Per L-8	Initial Calibration	A
		Accuracy/Bias	Per L-8	Calibration Verification	A
		Accuracy/Bias	Per L-8	Labeled Compound Spike	A
		Accuracy/Bias	Per L-8	Labeled Internal Standards	A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	PCB Congeners
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-9, L-21	Accuracy/Bias	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of L-9	Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Accuracy/Bias	Per L-9	Initial Calibration	A
		Accuracy/Bias	Per L-9	Calibration Verification	A
		Accuracy/Bias	Per L-9	Labeled Compound Spike	A
		Accuracy/Bias	Per L-9	Labeled Internal Standards	A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	Chlorinated Herbicides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-10, L-25	Accuracy/Bias	**Surrogate Compounds**	**% Recovery**	Surrogate Spikes	A
			DCAA	50-120		
		Accuracy/Bias	**Compound**	**% Recovery**	Laboratory Control Sample	A
			All target analytes	70-130		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	TOC
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-12	Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Accuracy/Bias	% Recovery 50-150	Laboratory Control Sample	A
		Accuracy/Bias	No target compounds >PQL	Instrument Blank	S & A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	TEPH
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-13	Accuracy/Bias	**Surrogate Compounds**	**% Recovery**	Surrogate Spikes	A
			Chlorobenzene	60-120		
			Ortho-terphenyl	60-120		
		Accuracy/Bias	**Compound**	**% Recovery**	Laboratory Control Sample	A
			#2 Diesel	70-120		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-1 for footnotes .

QAPP Worksheet #12-1
Measurement Performance Criteria – Field/Rinse/Equipment Blank (Continued)

Matrix	Field/Rinse/ Equipment Blank
Analytical Group [a]	TSS and TDS
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-6	L-15, L-16	Accuracy/Bias	% Recovery 75-125	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Precision - Lab	RPD ≤20% when target is detected in the sample at ≥5X the PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL	Duplicate Laboratory	A

Notes:
[a] If information varies within an analytical group, separate by individual analyte.
[b] Reference number from Worksheet #21.
[c] Reference number from Worksheet #23.
[d] Per data validation SOP (USEPA Region 2 SOP HW-35, Revision 1) during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%.
[e] Trip blanks will be collected, travel with environmental samples, and be submitted for analysis in association with any samples collected for volatile organics analysis.

DCAA = 2,4-dichlorophenylacetic acid
OPR = ongoing precision and recovery
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
TSS = total suspended solids
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate

Matrix	HSM Particulate
Analytical Group [a]	Semivolatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			Phenol	<35		
			2-Chlorophenol	<50		
			N-Nitroso-di-n-propylamine	<38		
			4-Chloro-3-methylphenol	<33		
			Acenaphthene	<19		
			4-Nitrophenol	<50		
			2,4-Dinitrotoluene	<47		
			Pentachlorophenol	<47		
			Pyrene	<36		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			Phenol	26-90		
			2-Chlorophenol	25-102		
			N-Nitroso-di-n-propylamine	41-126		
			4-Chloro-3-methylphenol	26-103		
			Acenaphthene	31-137		
			4-Nitrophenol	11-114		
			2,4-Dinitrotoluene	28-89		
			Pentachlorophenol	17-109		
			Pyrene	35-142		
		Precision-Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	Semivolatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1	Accuracy/Bias	**Surrogate Compounds**	**% Recovery** [d]	Surrogate Spikes	A
			Phenol-d_5	17-103		
			Bis(2-chloroethyl)ether -d_8	12-98		
			2-Chlorophenol-d_4	13-101		
			4-Methylphenol-d_8	8-100		
			Nitrobenzene-d_5	16-103		
			2-Nitrophenol-d_4	16-104		
			2,4-Dichlorophenol-d_3	23-104		
			4-Chloroaniline-d_4	1-145		
			Dimethylphthalate- d_6	43-111		
			Acenaphthylene-d_8	20-97		
			4-Nitrophenol-d_4	16-166		
			Fluorene- d_{10}	40-108		
			4,6-Dinitro-2-methylphenol-d_2	1-121		
			Anthracene-d_{10}	22-98		
			Pyrene- d_{10}	51-120		
			Benzo(a)pyrene-d_{12}	43-111		
		Accuracy/Bias Contamination	No target compounds ≥PQL.		Method Blanks, Field Blanks and Rinsate Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	Volatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			1,1-Dichloroethene	<22		
			Trichloroethene	<24		
			Benzene	<21		
			Toluene	<21		
			Chlorobenzene	<21		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			1,1-Dichloroethene	59-172		
			Trichloroethene	62-137		
			Benzene	66-142		
			Toluene	59-139		
			Chlorobenzene	60-133		
		Precision-Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	Volatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1	Accuracy/Bias	**Surrogate Compounds**	**% Recovery**	Surrogate Spikes	A
			Vinyl chloride-d_3	68-122		
			Chloroethane-d_5	61-130		
			1,1-Dichloroethene- d_2	45-132		
			2-Butanone-d_5	20-182		
			Chloroform-d	72-123		
			1,2-Dichloroethane-d_4	79-122		
			Benzene- d_6	80-121		
			1,2-Dichloropropane-d_6	74-124		
			Toluene-d_8	78-121		
			Trans-1,3-Dichloropropene-d_4	72-130		
			2-hexanone-d_5	17-184		
			1,1,2,2-Tetrachloroethane-d_2	56-161		
			1,2-Dichlorobenzene -d_4	70-131		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, Rinsate Blanks, and Trip Blanks [e]	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	Aroclor PCBs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			Aroclor-1016	<15		
			Aroclor-1260	<20		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			Aroclor-1016	29-135		
			Aroclor-1260	29-135		
		Accuracy/Bias	**Surrogate Compound**	**% Recovery**	Surrogate Spikes	A
			Tetrachloro- m-xylene	30-150		
			Decachlorobiphenyl	30-150		
		Accuracy/Bias	**Compound**	**% Recovery**	Laboratory Control Sample	A
			Aroclor-1016	50-150		
			Aroclor-1260	50-150		
		Accuracy/Bias Contamination	No target compounds ≥ PQL		Method Blanks, Field Blanks, Instrument Blanks, and Rinsate Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	Organochlorine Pesticides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-2, L-26	Precision - Lab	**Compound** All target analytes	**RPD** <25	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 50-150	Matrix Spike	A
		Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Instrument Blanks, Rinsate Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	Organochlorine Pesticides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-2, L-26	Accuracy/Bias	Per L-2	Initial Calibration	A
		Accuracy/Bias	Per L-2	Calibration Verification	A
		Accuracy/Bias	Per L-2	Labeled Compound Spike	A
		Accuracy/Bias	Per L-2	Labeled Internal Standards	A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	Semivolatile Organics (SIM)
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1	Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A
		Precision - Lab	**Compound** All target analytes	**RPD** <40	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	**Surrogate Compounds** Acenaphthene-d_{10} Chrysene-d_{12} Napthalene-d_8 Perylene- d_{12} Phenanthrene -d_{12}	**% Recovery** 20-130 20-130 20-130 20-130 20-130	Surrogate Spikes	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Rinsate Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	Cyanide
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-7	Precision - Lab	RPD ≤20% when target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL		Laboratory Duplicate	A
		Accuracy/Bias	**Compound** Cyanide	**% Recovery** 75-125	Matrix Spike	A
		Accuracy/Bias	All analyte concentrations must fall within the certified range of acceptance as noted on Form VII of the laboratory data package		Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥ PQL		Method Blanks, Field Blanks, Rinsate Blanks, and Instrument Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	PCDD/PCDFs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-8	Precision - Lab	**Compound** All target analytes	**RPD** <50	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	All target compound concentrations must fall within range provided in Table 6 of L-8		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Rinsate Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at > 5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples.		Field Duplicate	S & A
		Accuracy/Bias	Per L-8		Initial Calibration	A
		Accuracy/Bias	Per L-8		Calibration Verification	A
		Accuracy/Bias	Per L-8		Labeled Compound Spike	A
		Accuracy/Bias	Per L-8		Labeled Internal Standards	A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	PCB Congeners
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-9	Precision - Lab	**Compound** 86 target analytes	**RPD** <50	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** 86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration.	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	All target compounds contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of L-9		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥ PQL		Method Blanks, Field Blanks, and Rinsate Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at > 5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	PCB Congeners
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-9	Accuracy/Bias	Per L-9	Initial Calibration	A
		Accuracy/Bias	Per L-9	Calibration Verification	A
		Accuracy/Bias	Per L-9	Labeled Compound Spike	A
		Accuracy/Bias	Per L-9	Labeled Internal Standards	A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	Chlorinated Herbicides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-10	Precision - Lab	**Compound** All target analytes	**RPD** <35	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	**Surrogate Compounds** DCAA	**% Recovery** 50-120	Surrogate Spikes	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 70-130	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL.		Method Blanks, Field Blanks, and Rinsate Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	TOC
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-11	Precision - Lab	RPD ≤35% when target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL	Laboratory Duplicate	A
		Accuracy/Bias	% Recovery 50-150	Matrix Spike	A
		Accuracy/Bias	% Recovery 50-150	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks, Field Blanks, Rinsate Blanks , and Instrument Blanks	S & A
		Completeness	>90% sample collec tion, >90% laboratory analysis	Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field dupli cate samples	Field Duplicate	S & A

See the last page of Worksheet #12-2 for footnotes.

QAPP Worksheet #12-2
Measurement Performance Criteria – HSM Particulate (Continued)

Matrix	HSM Particulate
Analytical Group [a]	TEPH
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-13	Precision - Lab	RPD <50%		Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** #2 Diesel	**% Recovery** 70-130	Matrix Spike	A
		Accuracy/Bias	**Surrogate Compounds** Chlorobenzene Ortho-terphenyl	**% Recovery** 60-120 60-120	Surrogate Spikes	A
		Accuracy/Bias	**Compound** #2 Diesel	**% Recovery** 70-120	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Rinsate Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at > 5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

Notes:
[a] If information varies within an analytical group, separate by individual analyte.
[b] Reference number from Worksheet #21.
[c] Reference number from Worksheet #23.
[d] Per data validation SOP (USEPA Region 2 SOP HW-35, Revision 1) during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%.
[e] Trip blanks will be collected, travel with environmental samples, and be submitted for analysis in association with any samples collected for volatile organics analysis.

HSM = high-solids mass
DCAA = 2,4-dichlorophenylacetic acid
OPR = ongoing precision and recovery
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SIM = selective ion monitoring
SOP = standard operating procedure
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Semivolatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-17	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			Phenol	<42		
			2-Chlorophenol	<40		
			N-Nitroso-di-n-propylamine	<38		
			4-Chloro-3-methylphenol	<42		
			Acenaphthene	<31		
			4-Nitrophenol	<50		
			2,4-Dinitrotoluene	<38		
			Pentachlorophenol	<50		
			Pyrene	<31		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			Phenol	12-110		
			2-Chlorophenol	27-123		
			N-Nitroso-di-n-propylamine	41-116		
			4-Chloro-3-methylphenol	23-97		
			Acenaphthene	46-118		
			4-Nitrophenol	10-80		
			2,4-Dinitrophenol	24-96		
			Pentachlorophenol	9-103		
			Pyrene	26-127		
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Semivolatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-17	Accuracy/Bias	**Surrogate Compounds**	**% Recovery** [d]	Surrogate Spikes	A
			Phenol-d_5	39-106		
			Bis(2-chloroethyl)ether -d_8	40-105		
			2-Chlorophenol-d_4	41-106		
			4-Methylphenol-d_8	25-111		
			Nitrobenzene-d_5	43-108		
			2-Nitrophenol-d_4	40-108		
			2,4-Dichlorophenol-d_3	37-105		
			4-Chloroaniline-d_4	1-145		
			Dimethylphthalate- d_6	47-114		
			Acenaphthylene-d_8	41-107		
			4-Nitrophenol-d_4	33-116		
			Fluorene- d_{10}	42-111		
			4,6-Dinitro-2-methylphenol-d_2	22-104		
			Anthracene-d_{10}	44-110		
			Pyrene- d_{10}	52-119		
			Benzo(a)pyrene-d_{12}	32-121		
		Accuracy/Bias Contamination	No target compounds ≥ PQL		Field Blanks and Method Blanks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes.

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Volatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			1,1-Dichloroethene	<14		
			Trichloroethene	<14		
			Benzene	<11		
			Toluene	<13		
			Chlorobenzene	<13		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			1,1-Dichloroethene	61-145		
			Trichloroethene	71-120		
			Benzene	76-127		
			Toluene	76-125		
			Chlorobenzene	75-130		
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes.

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/ Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Volatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1	Accuracy/Bias	**Surrogate Compounds**	**% Recovery**	Surrogate Spikes	A
			Vinyl chloride-d_3	65-131		
			Chloroethane-d_5	71-131		
			1,1-Dichloroethene- d_2	55-104		
			2-Butanone-d_5	49-155		
			Chloroform-d	78-121		
			1,2-Dichloroethane-d_4	78-129		
			Benzene- d_6	77-124		
			1,2-Dichloropropane-d_6	79-124		
			Toluene-d_8	77-121		
			Trans-1,3-Dichloropropene-d_4	73-121		
			2-hexanone-d_5	28-135		
			1,1,2,2-Tetrachloroethane-d_2	73-125		
			1,2-Dichlorobenzene -d_4	80-131		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Field Blanks, Trip Blanks[e], and Method Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Aroclor PCBs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-25	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			Aroclor-1016	<15		
			Aroclor-1260	<20		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			Aroclor-1016	29-135		
			Aroclor-1260	29-135		
		Accuracy/Bias	**Surrogate Compound**	**% Recovery**	Surrogate Spikes	A
			Tetrachloro- m-xylene	30-150		
			Decachlorobiphenyl	30-150		
		Accuracy/Bias	**Compound**	**% Recovery**	Laboratory Control Sample	A
			Aroclor-1016	50-150		
			Aroclor-1260	50-150		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Instrument Blanks, and Field Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Organochlorine Pesticides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-2, L-19	Precision - Lab	**Compound** All target analytes	**RPD** <25	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 50-150	Matrix Spike	A
		Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Field Blanks, Method Blanks, and Instrument Blanks	S & A
		Precision - Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Organochlorine Pesticides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-2, L-19	Accuracy/Bias	Per L-2	Initial Calibration	A
		Accuracy/Bias	Per L-2	Calibration Verification	A
		Accuracy/Bias	Per L-2	Labeled Compound Spike	A
		Accuracy/Bias	Per L-2	Labeled Internal Standards	A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Semivolatile Organics (SIM)
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-18	Precision - Lab	**Compound** All target analytes	**RPD** <40	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	**Surrogate Compounds** Naphthalene-d_8 Acenaphthene-d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene -d_{12}	**% Recovery** 20-130 20-130 20-130 20-130 20-130	Surrogate Spikes	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Field Blanks and Method Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Cyanide
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-7	Precision - Lab	RPD ≤20% when target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL		Laboratory Duplicate	A
		Accuracy/Bias	**Analyte** Cyanide	**% Recovery** 80-120	Laboratory Control Sample	A
		Accuracy/Bias	**Analyte** Cyanide	**% Recovery** 75-125	Matrix Spike	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Field Blanks, Method Blanks, and Instrument Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	PCDD/PCDFs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-8, L-20	Precision - Lab	**Compound** All target analytes	**RPD** <50	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	All target compound concentrations must fall within range provided in Table 6 of L-8		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks and Field Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A
		Accuracy/Bias	Per L-8		Initial Calibration	A
		Accuracy/Bias	Per L-8		Calibration Verification	A
		Accuracy/Bias	Per L-8		Labeled Compound Spike	A
		Accuracy/Bias	Per L-8		Labeled Internal Standards	A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	PCB Congeners
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-9, L-21	Precision - Lab	**Compound** 86 target analytes	**RPD** <50	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** 86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of L-9		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥ PQL		Method Blanks and Field Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes.

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	PCB Congeners
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-9, L-21	Accuracy/Bias	Per L-9	Initial Calibration	A
		Accuracy/Bias	Per L-9	Calibration Verification	A
		Accuracy/Bias	Per L-9	Labeled Compound Spike	A
		Accuracy/Bias	Per L-9	Labeled Internal Standard	A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Chlorinated Herbicides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-10, L-25	Precision - Lab	**Compound** All target analytes	**RPD** <35	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	**Surrogate Compounds** DCAA	**% Recovery** 50-120	Surrogate Spikes	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 70-130	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks and Field Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	DOC/TOC
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-12	Precision - Lab	RPD ≤35% When target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when the sample is <5X PQL	Laboratory Duplicate	A
		Accuracy/Bias	% Recovery 50-150	Matrix Spike	A
		Accuracy/Bias	% Recovery 50-150	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks, Instrument Blanks, and Field Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Precision - Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples	Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	TEPH
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-13	Precision - Lab	RPD <50%		Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** #2 Diesel	**% Recovery** 70-130	Matrix Spike	A
		Accuracy/Bias	**Surrogate Compounds** Chlorobenzene Ortho-terphenyl	**% Recovery** 60-120 60-120	Surrogate Spikes	A
		Accuracy/Bias	**Compound** #2 Diesel	**% Recovery** 70-120	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks and Field Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	Grain Size
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-14	Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples	Field Duplicate	S & A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Precision-Lab	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples	Laboratory Duplicate	A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group [a]	TSS and TDS
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-15, L-16	Precision - Lab	RPD ≤20% when target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQLs	Laboratory Duplicate	A
		Accuracy/Bias	% Recovery 75-125	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks and Field Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Precision - Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples	Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes .

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	Whole Water (HSM Dissolved is not analyzed for Metals, Mercury, and Methylmercury)
Analytical Group [a]	Metals, Mercury, and Methyl mercury
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-5	L-4, L-5, L-6	Accuracy/Bias	**Analyte**	**% Recovery**	Ongoing Precision and Recovery	A
			Aluminum	80-120		
			Antimony	79-122		
			Cadmium	84-113		
			Copper	51-145		
			Lead	72-143		
			Mercury	77-123		
			Methyl Mercury	67-133		
			Nickel	68-134		
			Selenium	59-149		
			Silver	74-119		
			Thallium	64-137		
			Zinc	46-146		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, Trip Blanks[e], and Instrument Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Accuracy/Bias	Per L-4, L-5, L-6		Initial Precision and Recovery	A
		Accuracy/Bias	Per L-4, L-5, L-6		Initial Calibration	A
		Accuracy/Bias	Per L-4, L-5, L-6		Calibration Verification	A

See the last page of Worksheet #12-3 for footnotes.

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Matrix	Whole Water (HSM Dissolved is not analyzed for Metals, Mercury, and Methylmercury)
Analytical Group [a]	Metals, Mercury , and Methyl mercury
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-5	L-4, L-5, L-6	Precision - Lab	RPD ≤20% for metals, RPD ≤24% for mercury and RPD ≤ 35% for methylmercury when target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL		Matrix Spike Duplicate	A
		Accuracy/Bias	**Analyte**	**% Recovery**	Matrix Spike	A
			Aluminum	75-125		
			Antimony	79-122		
			Cadmium	84-113		
			Copper	51-145		
			Lead	72-143		
			Mercury	71-125		
			Methyl Mercury	65-135		
			Nickel	68-134		
			Selenium	59-149		
			Silver	74-119		
			Thallium	64-137		
			Zinc	46-146		
		Precision - Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-3 for footnotes.

QAPP Worksheet #12-3
Measurement Performance Criteria – HSM Dissolved/Whole Water (Continued)

Notes:

[a] If information varies within an analytical group, separate by individual analyte.
[b] Reference number from Worksheet #21.
[c] Reference number from Worksheet #23.
[d] Per data validation SOP (USEPA Region 2 SOP HW-35, Revision 1) during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%.
[e] Trip blanks will be collected, travel with environmental samples, and be submitted for analysis in association with any samples collected for volatile organics and metals, mercury, and methylmercury analyses.

DCAA = 2,4-dichlorophenylacetic acid
DOC = dissolved organic carbon
HSM = high-solids mass
OPR = ongoing precision recovery
PCB = polychlorinated biphenyl
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
TSS = total suspended solids
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate

Matrix	LSM Particulate
Analytical Group [a]	Semivolatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-23, L-24	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			Phenol	<35		
			2-Chlorophenol	<50		
			N-Nitroso-di-n-propylamine	<38		
			4-Chloro-3-methylphenol	<33		
			Acenaphthene	<19		
			4-Nitrophenol	<50		
			2,4-Dinitrotoluene	<47		
			Pentachlorophenol	<47		
			Pyrene	<36		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			Phenol	26-90		
			2-Chlorophenol	25-102		
			N-Nitroso-di-n-propylamine	41-126		
			4-Chloro-3-methylphenol	26-103		
			Acenaphthene	31-137		
			4-Nitrophenol	11-114		
			2,4-Dinitrotoluene	28-89		
			Pentachlorophenol	17-109		
			Pyrene	35-142		
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-4 for footnotes.

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	Semivolatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-23, L-24	Accuracy/Bias	**Surrogate Compounds**	**% Recovery** [d]	Surrogate Spikes	A
			Phenol-d_5	17-103		
			Bis(2-chloroethyl)ether -d_8	12-98		
			2-Chlorophenol-d_4	13-101		
			4-Methylphenol-d_8	8-100		
			Nitrobenzene-d_5	16-103		
			2-Nitrophenol-d_4	16-104		
			2,4-Dichlorophenol-d_3	23-104		
			4-Chloroaniline-d_4	1-145		
			Dimethylphthalate- d_6	43-111		
			Acenaphthylene-d_8	20-97		
			4-Nitrophenol-d_4	16-166		
			Fluorene- d_{10}	40-108		
			4,6-Dinitro-2-methylphenol-d_2	1-121		
			Anthracene-d_{10}	22-98		
			Pyrene- d_{10}	51-120		
			Benzo(a)pyrene-d_{12}	43-111		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-4 for footnotes.

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	Aroclor PCBs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-23, L-24	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			Aroclor-1016	<15		
			Aroclor-1260	<20		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			Aroclor-1016	29-135		
			Aroclor-1260	29-135		
		Accuracy/Bias	**Surrogate Compound**	**% Recovery**	Surrogate Spikes	A
			Tetrachloro- m-xylene	30-150		
			Decachlorobiphenyl	30-150		
		Accuracy/Bias	**Compound**	**% Recovery**	Laboratory Control Sample	A
			Aroclor-1016	50-150		
			Aroclor-1260	50-150		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Instrument Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-4 for footnotes.

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	Organochlorine Pesticides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-2, L-23, L-24	Precision - Lab	**Compound** All target analytes	**RPD** <25	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 50-150	Matrix Spike	A
		Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2.		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Instrument Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-4 for footnotes.

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	Organochlorine Pesticides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-2, L-23, L-24	Accuracy/Bias	Per L-8	Initial Calibration	A
		Accuracy/Bias	Per L-8	Calibration Verification	A
		Accuracy/Bias	Per L-8	Labeled Compound Spike	A
		Accuracy/Bias	Per L-8	Labeled Internal Standards	A

See the last page of Worksheet #12-4 for footnotes .

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	Semivolatile Organics (SIM)
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-23, L-24	Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A
		Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			All target analytes	<40		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			All target analytes	60-140		
		Accuracy/Bias	**Surrogate Compounds**	**% Recovery**	Surrogate Spikes	A
			Acenaphthene-d_{10}	20-130		
			Chrysene-d_{12}	20-130		
			Napthalene-d_8	20-130		
			Perylene- d_{12}	20-130		
			Phenanthrene -d_{12}	20-130		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-4 for footnotes.

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	PCDD/PCDFs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-8, L-23, L-24	Precision - Lab	**Compound** All target analytes	**RPD** <50	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	All target compound concentrations must fall within range provided in Table 6 of L-8		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A
		Accuracy/Bias	Per L-8		Initial Calibration	A
		Accuracy/Bias	Per L-8		Calibration Verification	A
		Accuracy/Bias	Per L-8		Labeled Compound Spike	A
		Accuracy/Bias	Per L-8		Labeled Internal Standards	A

See the last page of Worksheet #12-4 for footnotes.

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	PCB Congeners
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-9, L-23, L-24	Precision - Lab	**Compound** 86 target analytes	**RPD** <50	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** 86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	All target compounds contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of L-9		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥ PQL		Method Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-4 for footnotes.

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	PCB Congeners
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP -4	L-9, L-23, L-24	Accuracy/Bias	Per L-9	Initial Calibration	A
		Accuracy/Bias	Per L-9	Calibration Verification	A
		Accuracy/Bias	Per L-9	Labeled Compound Spike	A
		Accuracy/Bias	Per L-9	Labeled Internal Standards	A

See the last page of Worksheet #12-4 for footnotes.

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	Chlorinated Herbicides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-10, L-23, L-24	Precision - Lab	**Compound** All target analytes	**RPD** <35	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	**Surrogate Compounds** DCAA	**% Recovery** 50-120	Surrogate Spikes	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 70-130	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-4 for footnotes.

QAPP Worksheet #12-4
Measurement Performance Criteria – LSM Particulate (Continued)

Matrix	LSM Particulate
Analytical Group [a]	POC
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-11, L-22	Precision - Lab	RPD ≤35% when target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL	Laboratory Duplicate	A
		Accuracy/Bias	% Recovery 50-150	Matrix Spike	A
		Accuracy/Bias	% Recovery 50-150	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks, Field Blanks, Instrument Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Precision - Overall	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples	Field Duplicate	S & A

Notes:
[a] If information varies within an analytical group, separate by individual analyte.
[b] Reference number from Worksheet #21.
[c] Reference number from Worksheet #23.
[d] Per data validation SOP (USEPA Region 2 HW -35, Revision 1) during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%.

DCAA = 2,4-dichlorophenylacetic acid
LSM = low-solids mass
OPR = ongoing precision and recovery
PCBs = polychlorinated biphenyl
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
POC = particulate organic carbon
PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SIM = selective ion monitoring
SOP = Standard Operating Procedure
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved

Matrix	LSM Dissolved
Analytical Group [a]	Semivolatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-17, L-24	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			Phenol	<42		
			2-Chlorophenol	<40		
			N-Nitroso-di-n-propylamine	<38		
			4-Chloro-3-methylphenol	<42		
			Acenaphthene	<31		
			4-Nitrophenol	<50		
			2,4-Dinitrotoluene	<38		
			Pentachlorophenol	<50		
			Pyrene	<31		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			Phenol	12-110		
			2-Chlorophenol	27-123		
			N-Nitroso-di-n-propylamine	41-116		
			4-Chloro-3-methylphenol	23-97		
			Acenaphthene	46-118		
			4-Nitrophenol	10-80		
			2,4-Dinitrophenol	24-96		
			Pentachlorophenol	9-103		
			Pyrene	26-127		
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-5 for footnotes .

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	Semivolatile Organics
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-17, L-24	Accuracy/Bias	**Surrogate Compounds**	**% Recovery** [d]	Surrogate Spikes	A
			Phenol-d_5	39-106		
			Bis(2-chloroethyl)ether -d_8	40-105		
			2-Chlorophenol-d_4	41-106		
			4-Methylphenol-d_8	25-111		
			Nitrobenzene-d_5	43-108		
			2-Nitrophenol-d_4	40-108		
			2,4-Dichlorophenol-d_3	37-105		
			4-Chloroaniline-d_4	1-145		
			Dimethylphthalate- d_6	47-114		
			Acenaphthylene-d_8	41-107		
			4-Nitrophenol-d_4	33-116		
			Fluorene- d_{10}	42-111		
			4,6-Dinitro-2-methylphenol-d_2	22-104		
			Anthracene-d_{10}	44-110		
			Pyrene- d_{10}	52-119		
			Benzo(a)pyrene-d_{12}	32-121		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Field Blanks, Equipment Blanks, and Method Blanks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-5 for footnotes .

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	Aroclor PCBs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-24, L-25	Precision - Lab	**Compound**	**RPD**	Matrix Spike Duplicate	A
			Aroclor-1016	<15		
			Aroclor-1260	<20		
		Accuracy/Bias	**Compound**	**% Recovery**	Matrix Spike	A
			Aroclor-1016	29-135		
			Aroclor-1260	29-135		
		Accuracy/Bias	**Surrogate Compound**	**% Recovery**	Surrogate Spikes	A
			Tetrachloro- m-xylene	30-150		
			Decachlorobiphenyl	30-150		
		Accuracy/Bias	**Compound**	**% Recovery**	Laboratory Control Sample	A
			Aroclor-1016	50-150		
			Aroclor-1260	50-150		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Instrument Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection,>90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-5 for footnotes .

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	Organochlorine Pesticides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-2, L-19, L-24	Precision - Lab	**Compound** All target analytes	**RPD** <25	Matrix Spike Duplicate	A
		Precision -Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 50-150	Matrix Spike	A
		Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2.		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Field Blanks, Equipment Blanks, Method Blanks, and Instrument Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A

See the last page of Worksheet #12-5 for footnotes .

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	Organochlorine Pesticides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-2, L-19, L-24	Accuracy/Bias	Pre L-2	Initial Calibration	A
		Accuracy/Bias	Per L-2	Calibration Verification	A
		Accuracy/Bias	Per L-2	Labeled Compound Spike	A
		Accuracy/Bias	Per L-2	Labeled Internal Standards	A

See the last page of Worksheet #12-5 for footnotes.

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	Semivolatile Organics (SIM)
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-1, L-18, L-24	Precision - Lab	**Compound** All target analytes	**RPD** <40	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	**Surrogate Compounds** Naphthalene-d_8 Acenaphthene-d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene -d_{12}	**% Recovery** 20-130 20-130 20-130 20-130 20-130	Surrogate Spikes	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Equipment Blanks, Field Blanks, and Method Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-5 for footnotes.

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	PCDD/PCDFs
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-8, L-20, L-24	Precision - Lab	**Compound** All target analytes	**RPD** <50	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	All target compound concentrations must fall within range provided in Table 6 of L-8		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A
		Accuracy/Bias	Per L-8		Initial Calibration	A
		Accuracy/Bias	Per L-8		Calibration Verification	A
		Accuracy/Bias	Per L-8		Labeled Compound Spike	A
		Accuracy/Bias	Per L-8		Labeled Internal Standards	A

See the last page of Worksheet #12-5 for footnotes .

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	PCB Congeners
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-9, L-21, L-24	Precision - Lab	**Compound** 86 target analytes	**RPD** <50	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** 86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of L-9		Ongoing Precision and Recovery	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision-Overall	RPD ≤ 20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-5 for footnotes.

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	PCB Congeners
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-9, L-21, L-24	Accuracy/Bias	Per L-9	Initial Calibration	A
		Accuracy/Bias	Per L-9	Calibration Verification	A
		Accuracy/Bias	Per L-9	Labeled Compound Spike	A
		Accuracy/Bias	Per L-9	Labeled Internal Standard	A

See the last page of Worksheet #12-5 for footnotes .

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	Chlorinated Herbicides
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-10, L-24, L-25	Precision - Lab	**Compound** All target analytes	**RPD** <35	Matrix Spike Duplicate	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 60-140	Matrix Spike	A
		Accuracy/Bias	**Surrogate Compounds** DCAA	**% Recovery** 50-120	Surrogate Spikes	A
		Accuracy/Bias	**Compound** All target analytes	**% Recovery** 70-130	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL		Method Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Precision - Overall	RPD ≤ 20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

See the last page of Worksheet #12-5 for footnotes .

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group [a]	DOC
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-12, L-22	Precision - Lab	RPD ≤35% When target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when the sample is <5X PQL	Laboratory Duplicate	A
		Accuracy/Bias	% Recovery 50-150	Matrix Spike	A
		Accuracy/Bias	% Recovery 50-150	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks, Instrument Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples	Field Duplicate	S & A

See the last page of Worksheet #12-5 for footnotes .

QAPP Worksheet #12-5
Measurement Performance Criteria – LSM Dissolved (Continued)

Matrix	LSM Dissolved
Analytical Group[a]	TSS and TDS
Concentration Level	Low

Sampling Procedure[b]	Analytical Method/SOP[c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3, SOP-4	L-15, L-16	Precision - Lab	RPD ≤20% when target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQLs	Laboratory Duplicate	A
		Accuracy/Bias	% Recovery 75-125	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks, Field Blanks, and Equipment Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Precision - Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples	Field Duplicate	S & A

Notes:

[a] If information varies within an analytical group, separate by individual analyte.
[b] Reference number from Worksheet #21.
[c] Reference number from Worksheet #23.
[d] Per data validation SOP (USEPA Region 2 SOP HW-35, Revision 1) during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%.

DCAA - 2,4-dichlorophenylacetic acid
DOC = dissolved organic carbon
LSM = low-solids mass
OPR = ongoing precision and recovery
PCB = polychlorinated biphenyl
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TDS = total dissolved solids
TSS = total suspended solids
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #12-6
Measurement Performance Criteria – Grab Sample

Matrix	Grab Sample Whole Water and Grab Sample Dissolved
Analytical Group [a]	Metals, Mercury , and Methyl mercury
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-5	L-4, L-5, L-6	Accuracy/Bias	**Analyte**	**% Recovery**	Ongoing Precision and Recovery	A
			Aluminum	80-120		
			Antimony	79-122		
			Cadmium	84-113		
			Copper	51-145		
			Lead	72-143		
			Mercury	77-123		
			Methyl Mercury	67-133		
			Nickel	68-134		
			Selenium	59-149		
			Silver	74-119		
			Thallium	64-137		
			Zinc	46-146		
		Accuracy/Bias Contamination	No target compounds ≥PQL		Equipment Blanks, Field Blanks, Trip Blanks, and Instrument Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis		Data Completeness Checks	S & A
		Accuracy/Bias	Per L-4, L-5, L-6		Initial Precision and Recovery	A
		Accuracy/Bias	Per L-4, L-5, L-6		Initial Calibration	A
		Accuracy/Bias	Per L-4, L-5, L-6		Calibration Verification	A

See the last page of Worksheet #12-6 for footnotes.

QAPP Worksheet #12-6
Measurement Performance Criteria – Grab Sample (Continued)

Matrix	Grab Sample Whole Water and Grab Sample Dissolved
Analytical Group [a]	Metals, Mercury , and Methyl mercury
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria		QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-5	L-4, L-5, L-6	Precision - Lab	RPD ≤20% for metals, RPD ≤24% for mercury and RPD ≤35% for methylmercury when target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL		Matrix Spike Duplicate	A
		Accuracy/Bias	**Analyte**	**% Recovery**	Matrix Spike	A
			Aluminum	75-125		
			Antimony	79-122		
			Cadmium	84-113		
			Copper	51-145		
			Lead	72-143		
			Mercury	71-125		
			Methyl Mercury	65-135		
			Nickel	68-134		
			Selenium	59-149		
			Silver	74-119		
			Thallium	64-137		
			Zinc	46-146		
		Precision - Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples		Field Duplicate	S & A

Notes:

[a] If information varies within an analytical group, separate by individual analyte.
[b] Reference number from Worksheet #21.
[c] Reference number from Worksheet #23.

PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SOP = Standard Operating Procedure
% = percent

QAPP Worksheet #12-7
Measurement Performance Criteria – Grab Sample Whole Water

Matrix	Grab Sample Whole Water
Analytical Group [a]	TSS and TDS
Concentration Level	Low

Sampling Procedure [b]	Analytical Method/SOP [c]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S & A)
SOP-3	L-15, L-16	Precision - Lab	RPD ≤20% when target is detected in the sample at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQLs	Laboratory Duplicate	A
		Accuracy/Bias	% Recovery 75-125	Laboratory Control Sample	A
		Accuracy/Bias Contamination	No target compounds ≥PQL	Method Blanks and Field Blanks	S & A
		Completeness	>90% sample collection, >90% laboratory analysis	Data Completeness Checks	S & A
		Precision-Overall	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples	Field Duplicate	S & A

Notes:

[a] If information varies within an analytical group, separate by individual analyte.
[b] Reference number from Worksheet #21.
[c] Reference number from Worksheet #23.

PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SOP = Standard Operating Procedure
TDS = total dissolved solids
TSS = total suspended solids
% = percent

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: Semivolatile Organics
Concentration Level: Low
Analytical Method/SOP Reference: L-1/L-17

Analyte	CAS Number	Project Quantitation Limit µg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs µg/L	Method QLs µg/L	MDLs µg/L	QLs µg/L
Benzaldehyde	100-52-7	1.0	Not provided in method	5.0	0.317	1.0
Phenol	108-95-2	1.0	Not provided in method	5.0	0.145	1.0
bis(2-Chloroethyl) ether	111-44-4	1.0	Not provided in method	5.0	0.141	1.0
2-Chlorophenol	95-57-8	1.0	Not provided in method	5.0	0.148	1.0
2-Methylphenol	95-48-7	1.0	Not provided in method	5.0	0.146	1.0
2,2'-oxybis(1-Chloropropane)	108-60-1	1.0	Not provided in method	5.0	0.132	1.0
Acetophenone	98-86-2	1.0	Not provided in method	5.0	0.142	1.0
4-Methylphenol	106-44-5	1.0	Not provided in method	5.0	0.125	1.0
N-Nitroso-di-n-propylamine	621-64-7	1.0	Not provided in method	5.0	0.129	1.0
Hexachloroethane	67-72-1	1.0	Not provided in method	5.0	0.299	1.0
Nitrobenzene	98-95-3	1.0	Not provided in method	5.0	0.163	1.0
Isophorone	78-59-1	1.0	Not provided in method	5.0	0.130	1.0
2-Nitrophenol	88-75-5	1.0	Not provided in method	5.0	0.129	1.0
2,4-Dimethylphenol	105-67-9	1.0	Not provided in method	5.0	0.172	1.0
bis(2-Chloroethoxy) methane	111-91-1	1.0	Not provided in method	5.0	0.254	1.0
2,4-Dichlorophenol	120-83-2	1.0	Not provided in method	5.0	0.142	1.0
4-Chloroaniline	106-47-8	1.0	Not provided in method	5.0	0.836	1.0
Hexachlorobutadiene	87-68-3	1.0	Not provided in method	5.0	0.246	1.0
Caprolactam	105-60-2	1.0	Not provided in method	5.0	0.174	1.0
4-Chloro-3-methyphenol	59-50-7	1.0	Not provided in method	5.0	0.072	1.0
Hexachlorocyclopentadiene	77-47-4	1.0	Not provided in method	5.0	0.102	1.0
2,4,6-Trichlorophenol	88-06-2	1.0	Not provided in method	5.0	0.152	1.0
2,4,5-Trichlorophenol	95-95-4	1.0	Not provided in method	5.0	0.152	1.0
1,1'-Biphenyl	92-52-4	1.0	Not provided in method	5.0	0.195	1.0

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: Semivolatile Organics
Concentration Level: Low
Analytical Method/SOP Reference: L-1/L-17

Analyte	CAS Number	Project Quantitation Limit µg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs µg/L	Method QLs µg/L	MDLs µg/L	QLs µg/L
2-Chloronapthalene	91-58-7	1.0	Not provided in method	5.0	0.200	1.0
2-Nitroaniline	88-74-4	2.0	Not provided in method	10	0.294	2.0
Dimethylphthalate	131-11-3	1.0	Not provided in method	5.0	0.126	1.0
2,6-Dinitrotoluene	606-20-2	1.0	Not provided in method	5.0	0.138	1.0
3-Nitroaniline	99-09-2	2.0	Not provided in method	10	1.806	2.0
2,4-Dinitrophenol	51-28-5	2.0	Not provided in method	10	0.456	2.0
4-Nitrophenol	100-02-7	2.0	Not provided in method	10	0.467	2.0
Dibenzofuran	132-64-9	1.0	Not provided in method	5.0	0.108	1.0
2,4-Dinitrotoluene	121-14-2	1.0	Not provided in method	5.0	0.141	1.0
Diethylphthalate	84-66-2	1.0	Not provided in method	5.0	0.113	1.0
4-Chlorophenyl -phenylether	7005-72-3	1.0	Not provided in method	5.0	0.131	1.0
4-Nitroaniline	100-01-6	2.0	Not provided in method	10	1.818	2.0
4,6-Dinitro-2-methylphenol	534-52-1	2.0	Not provided in method	10	0.295	2.0
N-Nitrosodiphenylamine	86-30-6	1.0	Not provided in method	5.0	0.274	1.0
1,2,4,5-Tetrachlorobenzene	95-94-3	1.0	Not provided in method	5.0	0.230	1.0
4-Bromophenyl -phenylether	101-55-3	1.0	Not provided in method	5.0	0.143	1.0
Hexachlorobenzene	118-74-1	1.0	Not provided in method	5.0	0.137	1.0
Atrazine	1912-24-9	1.0	Not provided in method	5.0	0.807	1.0
Pentachlorophenol	87-86-5	2.0	Not provided in method	10	0.514	2.0
Carbazole	86-74-8	1.0	Not provided in method	5.0	0.338	1.0
Di-n-butylphthalate	84-74-2	1.0	Not provided in method	5.0	0.190	1.0
Butylbenzylphthalate	85-68-7	1.0	Not provided in method	5.0	0.21	1.0
3,3'-Dichlorobenzidene	91-94-1	1.0	Not provided in method	5.0	0.476	1.0
bis-(2-Ethylhexyl)phthalate	117-81-7	1.0	Not provided in method	5.0	0.20	1.0
Di-n-octylphthalate	117-84-0	1.0	Not provided in method	5.0	0.365	1.0
2,3,4,6-Tetrachlorphenol	58-90-2	1.0	Not provided in method	5.0	0.199	1.0

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix[a]: Whole Water, Field/ Rinse/Equipment Blank, and HSM Dissolved
Analytical Group: Volatile Organic Compounds
Concentration Level: Low
Analytical Method/SOP Reference: L-1

Analyte	CAS Number	Project Quantitation Limit µg/L	Analytical Method[b]		Achievable Laboratory Limits[c]	
			MDLs µg/L	Method QLs µg/L	MDLs µg/L	QLs µg/L
Chlorobenzene	108-90-7	0.50	Not provided in method	0.50	0.041	0.50
1,3-Dichlorobenzene	541-73-1	0.50	Not provided in method	0.50	0.055	0.50
1,4-Dichlorobenzene	106-46-7	0.50	Not provided in method	0.50	0.065	0.50
1,2-Dichlorobenzene	95-50-1	0.50	Not provided in method	0.50	0.051	0.50
1,2,4-Trichlorobenzene	120-82-1	0.50	Not provided in method	0.50	0.059	0.50
1,2,3-Trichlorobenzene	87-61-6	0.50	Not provided in method	0.50	0.050	0.50

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix[a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: Aroclor PCBs
Concentration Level: Low
Analytical Method/SOP Reference: L-1

Analyte	CAS Number	Project Quantitation Limit µg/L	Analytical Method[b]		Achievable Laboratory Limits[c]	
			MDLs µg/L	Method QLs µg/L	MDLs µg/L	QLs µg/L
Aroclor-1016	12674-11-2	1.0	Not provided in method	1.0	0.083	1.0
Aroclor-1221	11104-28-2	1.0	Not provided in method	1.0	0.12	1.0
Aroclor-1232	11141-16-5	1.0	Not provided in method	1.0	0.067	1.0
Aroclor-1242	53469-21-9	1.0	Not provided in method	1.0	0.093	1.0
Aroclor-1248	12672-29-6	1.0	Not provided in method	1.0	0.17	1.0
Aroclor-1254	11097-69-1	1.0	Not provided in method	1.0	0.11	1.0
Aroclor-1260	11096-82-5	1.0	Not provided in method	1.0	0.13	1.0
Aroclor-1262	37324-23-5	1.0	Not provided in method	1.0	0.085	1.0
Aroclor-1268	11100-14-4	1.0	Not provided in method	1.0	0.13	1.0

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/E quipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: Organochlorine Pesticides
Concentration Level: Low
Analytical Method/SOP Reference: L-2/L-19

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
2,4'-DDD	53-19-0	16	3	30	2.6	16
2,4'-DDE	3424-82-6	32	3	30	4.8	32
2,4-DDT	789-02-6	32	2	30	6.2	32
4,4'-DDD	72-54-8	16	5	30	1.6	16
4,4'-DDE	72-55-9	32	6	30	7.1	32
4,4'-DDT	50-29-3	32	1	30	5.5	32
Aldrin	309-00-2	16	6	90	1.1	16
alpha-BHC	319-84-6	16	7	60	1.1	16
alpha-Chlordane	5103-71-9	16	7	30	4.6	16
beta-BHC	319-85-7	16	6	60	1.5	16
delta-BHC	319-86-8	16	5	60	2.4	16
Dieldrin	60-57-1	16	5	30	5.0	16
Endosulfan I	959-98-8	160	24	100	8.1	160
Endosulfan II	33213-65-9	160	30	100	21	160
Endosulfan sulfate	1031-07-8	160	13	40	18	160
Endrin	72-20-8	32	3	30	2.9	32
Endrin aldehyde	7421-93-4	160	Not provided in method	Not provided in method	13	160
Endrin ketone	53494-70-5	160	12	40	18	160
gamma-BHC	58-89-9	16	9	60	3.2	16
gamma-Chlordane	5103-74-2	16	6	50	4.8	16
Heptachlor	76-44-8	80	7	30	19	80
Heptachlor epoxide B (Cis)	1024-57-3	16	12	40	4.2	16
Hexachlorobenzene	118-74-1	16	4	40	5.6	16
Methoxychlor	72-43-5	160	7	30	12	160
Nonachlor(cis)	5103-73-1	16	4	30	2.6	16
Nonachlor(trans)	39765-80-5	16	11	40	2.8	16
Oxychlordane	27304-13-8	16	7	60	2.6	16
Mirex	2385-85-5	16	35	100	1.3	16

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: Semivolatile Organics (SIM)
Concentration Level: Low
Analytical Method/SOP Reference: L-1/L-18

Analyte	CAS Number	Project Quantitation Limit µg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs µg/L	Method QLs µg/L	MDLs µg/L	QLs µg/L
Naphthalene	91-20-3	0.004	Not provided in method	0.02	0.0008	0.004
2-Methylnaphthalene	91-57-6	0.004	Not provided in method	0.02	0.0005	0.004
1-Methylnaphthalene	90-12-0	0.004	Not provided in method	0.02	0.0004	0.004
2,6-Dimethylnaphthalene	581-42-0	0.004	Not provided in method	0.02	0.0003	0.004
2,3,5-Trimethylnaphthalene	2245-38-7	0.004	Not provided in method	0.02	0.0005	0.004
1,1'-Biphenyl	92-52-4	0.004	Not provided in method	0.02	0.0003	0.004
Acenaphthylene	208-96-8	0.004	Not provided in method	0.02	0.0002	0.004
Acenaphthene	83-32-9	0.004	Not provided in method	0.02	0.0004	0.004
Dibenzofuran	132-64-9	0.004	Not provided in method	Not provided in method	0.0004	0.004
Fluorene	86-73-7	0.004	Not provided in method	0.02	0.0005	0.004
Anthracene	120-12-7	0.004	Not provided in method	0.02	0.0004	0.004
Phenanthrene	85-01-8	0.004	Not provided in method	0.02	0.0006	0.004
1-Methylphenanthrene	832-69-9	0.004	Not provided in method	0.02	0.0003	0.004
3,6-Dimethylphenanthrene	1576-67-6	0.004	Not provided in method	Not provided in method	0.0006	0.004
Dibenzothiophene	135-65-0	0.004	Not provided in method	0.02	0.0003	0.004
Fluoranthene	206-44-0	0.004	Not provided in method	0.02	0.0005	0.004
Pyrene	129-00-0	0.004	Not provided in method	0.02	0.0006	0.004
Benzo[a]anthracene	56-55-3	0.004	Not provided in method	0.02	0.0003	0.004
Chrysene	218-01-9	0.004	Not provided in method	0.02	0.0002	0.004
Benzo[b]fluoranthene	205-99-2	0.004	Not provided in method	0.02	0.0005	0.004
Benzo[k]fluoranthene	207-08-9	0.004	Not provided in method	0.02	0.0004	0.004
Benzo[e]pyrene	192-97-2	0.004	Not provided in method	0.02	0.0004	0.004
Benzo[a]pyrene	50-32-8	0.004	Not provided in method	0.02	0.0003	0.004

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: Semivolatile Organics (SIM)
Concentration Level: Low
Analytical Method/SOP Reference: L-1/L-18

Analyte	CAS Number	Project Quantitation Limit µg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs µg/L	Method QLs µg/L	MDLs µg/L	QLs µg/L
Perylene	198-55-0	0.004	Not provided in method	0.02	0.0003	0.004
Indeno[1,2,3-c,d]-pyrene	193-39-5	0.004	Not provided in method	0.02	0.0004	0.004
Dibenzo[a,h]anthracene	53-70-3	0.004	Not provided in method	0.02	0.0004	0.004
Benzo[g,h,i]perylene	191-24-2	0.004	Not provided in method	0.02	0.0003	0.004
1-Methylanthracene	610-48-0	0.004	Not provided in method	Not provided in method	0.0005	0.004
1-Methylfluoranthene	25889-60-5	0.004	Not provided in method	Not provided in method	0.0003	0.004
1-Methylpyrene	2381-21-7	0.004	Not provided in method	Not provided in method	0.0002	0.004

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: PCDD/PCDFs
Concentration Level: Low
Analytical Method/SOP Reference: L-8/L-20

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
2,3,7,8-TCDD	1746-01-6	0.5	Not provided in method	10	0.10	0.5
1,2,3,7,8-PeCDD	40321-76-4	2.5	Not provided in method	50	0.44	2.5
1,2,3,6,7,8-HxCDD	57653-85-7	2.5	Not provided in method	50	0.45	2.5
1,2,3,4,7,8-HxCDD	39227-28-6	2.5	Not provided in method	50	0.21	2.5
1,2,3,7,8,9-HxCDD	19408-74-3	2.5	Not provided in method	50	0.20	2.5
1,2,3,4,6,7,8-HpCDD	35822-46-9	2.5	Not provided in method	50	0.40	2.5
OCDD	3268-87-9	5.0	Not provided in method	100	1.02	5.0
2,3,7,8-TCDF	51207-31-9	0.5	Not provided in method	10	0.15	0.5
1,2,3,7,8-PeCDF	57117-41-6	2.5	Not provided in method	50	0.56	2.5
2,3,4,7,8-PeCDF	57117-31-4	2.5	Not provided in method	50	0.59	2.5
1,2,3,6,7,8-HxCDF	57117-44-9	2.5	Not provided in method	50	0.20	2.5
1,2,3,7,8,9-HxCDF	72918-21-9	2.5	Not provided in method	50	0.33	2.5
1,2,3,4,7,8-HxCDF	70648-26-9	2.5	Not provided in method	50	0.19	2.5
2,3,4,6,7,8-HxCDF	60851-34-5	2.5	Not provided in method	50	0.30	2.5
1,2,3,4,6,7,8-HpCDF	67562-39-4	2.5	Not provided in method	50	0.29	2.5
1,2,3,4,7,8,9-HpCDF	55673-89-7	2.5	Not provided in method	50	0.22	2.5
OCDF	39001-02-0	5.0	Not provided in method	100	0.40	5.0
Total TCDD	41903-57-5	0.5	Not provided in method	Not provided in method	NA	NA
Total PeCDD	36088-22-9	2.5	Not provided in method	Not provided in method	NA	NA
Total HxCDD	34465-46-8	2.5	Not provided in method	Not provided in method	NA	NA
Total HpCDD	37871-00-4	2.5	Not provided in method	Not provided in method	NA	NA
Total TCDF	55722-27-5	0.5	Not provided in method	Not provided in method	NA	NA
Total PeCDF	30402-15-4	2.5	Not provided in method	Not provided in method	NA	NA
Total HxCDF	55684-94-1	2.5	Not provided in method	Not provided in method	NA	NA
Total HpCDF	38998-75-3	2.5	Not provided in method	Not provided in method	NA	NA

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: PCB Congeners
Concent ration Level: Low
Analytical Method/SOP Reference: L-9/L-21

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
PCB1	2051-60-7	1	82	200	0.23	1
PCB2	2051-61-8	1	4	10	0.14	1
PCB3	2051-62-9	1	88	200	0.26	1
PCB4/10	13029-08-8/33146-45-1	2	Not provided in method	Not provided in method	0.63	2
PCB6	25569-80-6	2	13	50	0.53	2
PCB5/8	16605-91-7/34883-43-7	2	Not provided in method	Not provided in method	1.74	2
PCB7/9	33284-50-3/34883-39-1	2	Not provided in method	Not provided in method	0.58	2
PCB11	2050-67-1	2	105	200	0.78	2
PCB12/13	2974-92-7/2974-90-5	2	28	100	0.63	2
PCB14	34883-41-5	2	31	100	0.29	2
PCB15	2050-68-2	1	183	500	0.68	1
PCB16/32	38444-78-9/38444-77-8	1	Not provided in method	Not provided in method	0.48	1
PCB17	37680-66-3	1	86	200	0.47	1
PCB18	37680-65-2	1	175	500	0.90	1
PCB19	38444-73-4	1	42	100	0.14	1
PCB20/21/33	38444-84-7/ 55702-46-0/38444-86-9	1	Not provided in method	Not provided in method	0.57	1
PCB22	38444-85-8	1	90	200	0.26	1
PCB23	55720-44-0	1	50	200	0.21	1
PCB24/27	55702-45-9/38444-76-7	1	Not provided in method	Not provided in method	0.18	1
PCB25	55712-37-3	1	55	200	0.21	1
PCB26	38444-81-4	1	83	200	0.28	1
PCB28	7012-37-5	1	192	500	0.64	1
PCB29	15862-07-4	1	83	200	0.21	1

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Diss olved , and LSM Dissolved
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9/L-21

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
PCB30	35693-92-6	1	175	500	0.16	1
PCB31	16606-02-3	1	152	500	0.60	1
PCB34	37680-68-5	1	74	200	0.22	1
PCB35	37680-69-6	1	77	200	0.19	1
PCB36	38444-87-0	1	79	200	0.47	1
PCB37	38444-90-5	1	132	500	0.14	1
PCB38	53555-66-1	1	83	200	0.28	1
PCB39	38444-88-1	1	85	200	0.49	1
PCB40	38444-93-8	1	119	500	0.21	1
PCB41/64/71/ 72	52663-59-9/52663-58-8/ 41464-46-4/41464-42-0	1	Not provided in method	Not provided in method	0.64	1
PCB42/59	36559-22-5/74472-33-6	1	Not provided in method	Not provided in method	0.25	1
PCB43/49	70362-46-8/41464-40-8	1	Not provided in method	Not provided in method	0.37	1
PCB44	41464-39-5	1	195	500	0.23	1
PCB45	70362-45-7	1	51	200	0.22	1
PCB46	41464-47-5	1	101	200	0.19	1
PCB47	2437-79-8	1	195	500	0.40	1
PCB48/75	70362-47-9/32598-12-2	1	Not provided in method	Not provided in method	0.30	1
PCB50	62796-65-0	1	58	200	0.48	1
PCB51	68194-04-7	1	51	200	0.28	1
PCB52/69	35693-99-3/60233-24-1	1	Not provided in method	Not provided in method	0.52	1
PCB53	41464-41-9	1	58	200	0.34	1
PCB54	15968-05-5	1	118	500	0.24	1
PCB55	74338-24-2	1	120	500	0.18	1

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9/L-21

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
PCB56/60	41464-43-1/33025-41-1	1	Not provided in method	Not provided in method	0.30	1
PCB57	70424-67-8	1	125	500	0.07	1
PCB58	41464-49-7	1	127	500	0.27	1
PCB61/70	33284-53-6/32598-11-1	1	171	500	0.24	1
PCB62	54230-22-7	1	57	200	0.16	1
PCB63	74472-34-7	1	138	500	0.12	1
PCB65	33284-54-7	1	195	500	0.20	1
PCB67	73575-53-8	1	147	500	0.17	1
PCB68	73575-52-7	1	149	500	0.18	1
PCB73	74338-23-1	1	160	500	0.09	1
PCB74	32690-93-0	1	171	500	0.22	1
PCB76/66	70362-48-0/32598-10-0	1	Not provided in method	Not provided in method	0.47	1
PCB77	32598-13-3	1	169	500	0.36	1
PCB78	70362-49-1	1	171	500	0.13	1
PCB79	41464-48-6	1	173	500	0.06	1
PCB80	33284-52-5	1	175	500	0.13	1
PCB81	70362-50-4	1	177	500	0.09	1
PCB82	52663-62-4	1	133	500	0.27	1
PCB83	60145-20-2	1	217	500	0.08	1
PCB84/92	52663-60-2/52663-61-3	1	Not provided in method	Not provided in method	0.37	1
PCB85/116	65510-45-4/18259-05-7	1	104	200	0.44	1
PCB86	55312-69-1	1	149	500	0.40	1
PCB87/117/125	38380-02-8/ 68194-11-6/74472-39-2	1	Not provided in method	Not provided in method	0.35	1

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9/L-21

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
PCB88/91	55215-17-3/68194-05-8	1	118	500	0.61	1
PCB89	73575-57-2	1	195	500	0.14	1
PCB90/101	68194-07-0/37680-73-2	1	241	1000	0.63	1
PCB93	73575-56-1	1	221	500	0.66	1
PCB94	73575-55-0	1	121	500	0.18	1
PCB95/98/102	38379-99-6/ 60233-25-2/68194-06-9	1	221	500	0.38	1
PCB96	73575-54-9	1	210	500	0.23	1
PCB97	41464-51-1	1	149	500	0.19	1
PCB99	38380-01-7	1	217	500	0.43	1
PCB100	39485-83-1	1	221	500	0.27	1
PCB103	60145-21-3	1	225	500	0.27	1
PCB104	56558-16-8	1	228	500	0.19	1
PCB105	32598-14-4	1	109	200	0.23	1
PCB106/118	70424-69-0/31508-00-6	1	Not provided in method	Not provided in method	0.47	1
PCB107/109	70424-68-9/74472-35-8	1	Not provided in method	Not provided in method	0.20	1
PCB108/112	70362-41-3/74472-36-9	1	Not provided in method	Not provided in method	0.33	1
PCB110	38380-03-9	1	243	1000	0.80	1
PCB111/115	39635-32-0/74472-38-1	1	243	1000	0.33	1
PCB113	68194-10-5	1	241	1000	0.25	1
PCB114	74472-37-0	1	120	500	0.12	1
PCB119	56558-17-9	1	149	500	0.23	1
PCB120	68194-12-7	1	147	500	0.25	1
PCB121	56558-18-0	1	209	500	0.20	1

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9/L-21

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
PCB122	76842-07-4	1	117	500	0.22	1
PCB123	65510-44-3	1	150	500	0.15	1
PCB124	70424-70-3	1	200	1000	0.27	1
PCB126	57465-28-8	1	136	500	0.12	1
PCB127	39635-33-1	1	278	1000	0.19	1
PCB128/162	38380-07-3/39635-34-2	1	Not provided in method	Not provided in method	0.26	1
PCB129	55215-18-4	1	211	500	0.19	1
PCB130	52663-66-8	1	136	500	0.23	1
PCB131	61798-70-7	1	121	500	0.15	1
PCB132/161	38380-05-1/74472-43-8	1	Not provided in method	Not provided in method	0.31	1
PCB133/142	35694-04-3/41411-61-4	1	Not provided in method	Not provided in method	0.28	1
PCB134/143	52704-70-8/68194-15-0	1	134	500	0.24	1
PCB135	52744-13-5	1	112	500	0.17	1
PCB136	38411-22-2	1	91	200	0.11	1
PCB137	35694-06-5	1	300	1000	0.22	1
PCB138/163/164	35065-28-2/ 74472-44-9/74472-45-0	1	Not provided in method	Not provided in method	0.62	1
PCB139/149	56030-56-9/38380-04-0	1	Not provided in method	Not provided in method	0.43	1
PCB140	59291-64-4	1	196	500	0.15	1
PCB141	52712-04-6	1	93	200	0.28	1
PCB144	68194-14-9	1	167	500	0.25	1
PCB145	74472-40-5	1	317	1000	0.29	1
PCB146/165	51908-16-8/74472-46-1	1	Not provided in method	Not provided in method	0.26	1
PCB147	68194-13-8	1	179	500	0.20	1

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9/L-21

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
PCB148	74472-41-6	1	324	1000	0.34	1
PCB150	68194-08-1	1	328	1000	0.23	1
PCB151	52663-63-5	1	112	500	0.23	1
PCB152	68194-09-2	1	238	1000	0.20	1
PCB153	35065-27-1	1	130	500	0.58	1
PCB154	60145-22-4	1	112	500	0.15	1
PCB155	33979-03-2	1	339	1000	0.16	1
PCB156	38380-08-4	1	132	500	0.14	1
PCB157	69782-90-7	1	132	500	0.14	1
PCB158/160	74472-42-7/41411-62-5	1	Not provided in method	Not provided in method	0.22	1
PCB159	39635-35-3	1	348	1000	0.21	1
PCB166	41411-63-6	1	124	500	0.19	1
PCB167	52663-72-6	1	115	500	0.16	1
PCB168	59291-65-5	1	130	500	0.14	1
PCB169	32774-16-6	1	161	500	0.10	1
PCB170	35065-30-6	1	162	500	0.19	1
PCB171	52663-71-5	1	374	1000	0.21	1
PCB172	52663-74-8	1	377	1000	0.15	1
PCB173	68194-16-1	1	374	1000	0.20	1
PCB174	38411-25-5	1	186	500	0.32	1
PCB175	40186-70-7	1	383	1000	0.21	1
PCB176	52663-65-7	1	385	1000	0.16	1
PCB177	52663-70-4	1	141	500	0.17	1
PCB178	52663-67-9	1	221	500	0.23	1

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9/L-21

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
PCB179	52663-64-6	1	229	500	0.23	1
PCB180	35065-29-3	1	136	500	0.30	1
PCB181	74472-47-2	1	396	1000	0.20	1
PCB182/187	60145-23-5/52663-68-0	1	Not provided in method	Not provided in method	0.29	1
PCB183	52663-69-1	1	401	1000	0.24	1
PCB184	74472-48-3	1	403	1000	0.26	1
PCB185	52712-05-7	1	401	1000	0.18	1
PCB186	74472-49-4	1	407	1000	0.22	1
PCB188	74487-85-7	1	235	500	0.13	1
PCB189	39635-31-9	1	177	500	0.26	1
PCB190	41411-64-7	1	234	500	0.19	1
PCB191	74472-50-7	1	418	1000	0.13	1
PCB192	*74472-51-8*	1	420	1000	0.16	1
PCB193	69782-91-8	1	136	500	0.19	1
PCB194	35694-08-7	1	170	500	0.12	1
PCB195	52663-78-2	1	427	1000	0.15	1
PCB196/203	42740-50-1/52663-76-0	1	Not provided in method	Not provided in method	0.47	1
PCB197	33091-17-7	1	245	1000	0.13	1
PCB198	68194-17-2	1	203	500	0.16	1
PCB199	52663-75-9	1	203	500	0.28	1
PCB200	52663-73-7	1	245	1000	0.24	1
PCB201	40186-71-8	1	440	1000	0.11	1
PCB202	2136-99-4	1	442	1000	0.19	1
PCB204	74472-52-9	1	447	1000	0.18	1

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolv ed, and LSM Dissolved
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9/L-21

Analyte	CAS Number	Project Quantitation Limit pg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs pg/L	Method QLs pg/L	MDLs pg/L	QLs pg/L
PCB205	74472-53-0	1	449	1000	0.20	1
PCB206	40186-72-9	1	451	1000	0.10	1
PCB207	52663-79-3	1	453	1000	0.17	1
PCB208	52663-77-1	1	455	1000	0.10	1
PCB209	2051-24-3	1	153	500	0.25	1

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix [a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: Chlorinated Herbicides
Concentration Level: Low
Analytical Method/SOP Referenc e: L-10

Analyte	CAS Number	Project Quantitation Limit µg/L	Analytical Method [b]		Achievable Laboratory Limits [c]	
			MDLs µg/L	Method QLs µg/L	MDLs µg/L	QLs µg/L
2,4-D	94-75-7	2	0.2	Not provided in method	0.65	2
2,4-DB	94-82-6	2	0.8	Not provided in method	0.47	2
2,4,5-TP(Silvex)	93-72-6	0.2	0.075	Not provided in method	0.028	0.2
2,4,5-T	93-76-5	1	0.08	Not provided in method	0.13	1

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Matrix[a]: Whole Water, Field/ Rinse/Equipment Blank, HSM Dissolved, and LSM Dissolved
Analytical Group: Miscellaneous Analytical Groups
Concentration Level: Low
Analytical Method/SOP Reference: L-7, L-12, L-13, L-14, L-15, and L-16

Analyte	CAS Number	Project Quantitation Limit	Analytical Method[b]		Achievable Laboratory Limits[c]	
			MDLs	Method QLs	MDLs	QLs
Cyanide[d]	57-12-5	10 µg/L	Not provided in method	10 µg/L	1.1µg/L	10 µg/L
DOC[e]	NA	1.0 µg/L	Not provided in method	1.0 mg/L	0.14 µg/L	1.0 µg/L
TOC	NA	1.0 µg/L	Not provided in method	1.0 mg/L	0.14 µg/L	1.0 µg/L
TEPH[f]	TEPH	0.30 mg/L	0.08 mgL	Not provided in method	0.061 mg/L	0.30 mg/L
Grain Size[f]	GS	0.1%	Not provided in method	Not provided in method	NA	0.1%
TSS[g,h]	NA	0.50 mg/L	Not provided in method	Not provided in method	NA	0.50 mg/L
TDS[g,h]	NA	5.0 mg/L	Not provided in method	Not provided in method	NA	0.50 mg/L

See the last page of Worksheet #15-1 for footnotes.

QAPP Worksheet #15-1
Reference Limits and Evaluation – Water (Continued)

Notes:

[a] Includes grab sample whole water for TSS and TDS analysis only.
[b] Analytical MDLs and QLs are those documented in validated methods.
[c] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.
[d] Cyanide and TEPH criteria applies only to whole water; field, rinse, and equipment blanks; and HSM dissolved matrices.
[e] DOC criteria applies only to HSM dissolved and LSM dissolved matrices.
[f] Grain size criteria applies only to whole water matrices.
[g] TSS and TDS criteria applies only to whole water, HSM dissolved, LSM dissolved, and grab samples whole water. It is not expected that the TSS value will need to be qualified due to non-compliant laboratory quality control or other technical issue. However, if it is anticipated that a TSS value will need to be qualified during analysis, Tierra will notify USEPA.
[h] Based on 1,000 milliliter sample volume.

% = percent
CAS = Chemical Abstracts Service
DOC = dissolved organic carbon
GS = grain size
HSM = high-solids mass
LSM = low-solids mass
MDL = method detection limit
mg/L = milligrams per liter
NA = not applicable
PCBs= polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans
pg/L = picograms per liter
QL = quantitation limit
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TBD = to be determined
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbon
Tierra = Tierra Solutions, Inc.
TOC = total organic carbon
TSS = total suspended solids
µg/L = micrograms per liter
USEPA = U.S. Environmental Protection Agency

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate

Matrix: HSM Particulate
Analytical Group: Semivolatile Organics
Concentration Level: Low
Analytical Method/SOP Reference: L-1

Analyte	CAS Number	Project Quantitation Limit µg/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs µg/kg
Benzaldehyde	100-52-7	170	Not provided in method	170	8.8	170
Phenol	108-95-2	170	Not provided in method	170	11	170
bis(2-Chloroethyl) ether	111-44-4	170	Not provided in method	170	13	170
2-Chlorophenol	95-57-8	170	Not provided in method	170	12	170
2-Methylphenol	95-48-7	170	Not provided in method	170	13	170
2,2'-oxybis(1-Chloropropane)	108-60-1	170	Not provided in method	170	14	170
Acetophenone	98-86-2	170	Not provided in method	170	9.2	170
4-Methylphenol	106-44-5	170	Not provided in method	170	13	170
N-Nitroso-di-n-propylamine	621-64-7	170	Not provided in method	170	10	170
Hexachloroethane	67-72-1	170	Not provided in method	170	14	170
Nitrobenzene	98-95-3	170	Not provided in method	170	13	170
Isophorone	78-59-1	170	Not provided in method	170	10	170
2-Nitrophenol	88-75-5	170	Not provided in method	170	14	170
2,4-Dimethylphenol	105-67-9	170	Not provided in method	170	8.2	170
bis(2-Chloroethoxy) methane	111-91-1	170	Not provided in method	170	12	170
2,4-Dichlorophenol	120-83-2	170	Not provided in method	170	14	170
4-Chloroaniline	106-47-8	170	Not provided in method	170	13	170
Hexachlorobutadiene	87-68-3	170	Not provided in method	170	14	170
Caprolactam	105-60-2	170	Not provided in method	170	15	170
4-Chloro-3-methyphenol	59-50-7	170	Not provided in method	170	12	170
Hexachlorocyclopentadiene	77-47-4	170	Not provided in method	170	26	170
2,4,6-Trichlorophenol	88-06-2	170	Not provided in method	170	12	170
2,4,5-Trichlorophenol	95-95-4	170	Not provided in method	170	20	170
1,1'-Biphenyl	92-52-4	170	Not provided in method	170	12	170

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: Semivolatile Organics
Concentration Level: Low
Analytical Method/SOP Reference: L-1

Analyte	CAS Number	Project Quantitation Limit µg/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs µg/kg
2-Chloronapthalene	91-58-7	170	Not provided in method	170	15	170
2-Nitroaniline	88-74-4	330	Not provided in method	330	43	330
Dimethylphthalate	131-11-3	170	Not provided in method	170	18	170
2,6-Dinitrotoluene	606-20-2	170	Not provided in method	170	16	170
3-Nitroaniline	99-09-2	330	Not provided in method	330	45	330
2,4-Dinitrophenol	51-28-5	330	Not provided in method	330	89	330
4-Nitrophenol	100-02-7	330	Not provided in method	330	94	330
Dibenzofuran	132-64-9	170	Not provided in method	170	12	170
2,4-Dinitrotoluene	121-14-2	170	Not provided in method	170	22	170
Diethylphthalate	84-66-2	170	Not provided in method	170	19	170
4-Chlorophenyl-phenylether	7005-72-3	170	Not provided in method	170	17	170
4-Nitroaniline	100-01-6	330	Not provided in method	330	60	330
4,6-Dinitro-2-methylphenol	534-52-1	330	Not provided in method	330	51	330
N-Nitrosodiphenylamine	86-30-6	170	Not provided in method	170	10	170
1,2,4,5-Tetrachlorobenzene	95-94-3	170	Not provided in method	170	16	170
4-Bromophenyl -phenylether	101-55-3	170	Not provided in method	170	11	170
Hexachlorobenzene	118-74-1	170	Not provided in method	170	11	170
Atrazine	1912-24-9	170	Not provided in method	170	16	170
Pentachlorophenol	87-86-5	330	Not provided in method	330	34	330
Carbazole	86-74-8	170	Not provided in method	170	19	170
Di-n-butylphthalate	84-74-2	170	Not provided in method	170	19	170
Butylbenzylphthalate	85-68-7	170	Not provided in method	170	17	170
3,3'-Dichlorobenzidine	91-94-1	170	Not provided in method	170	37	170
bis-(2-Ethylhexyl)phthalate	117-81-7	170	Not provided in method	170	13	170
Di-n-octylphthalate	117-84-0	170	Not provided in method	170	18	170
2,3,4,6-Tetrachlorphenol	58-90-2	170	Not provided in method	170	22	170

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: Volatile Organics
Concentration Level: Low
Analytical Method/SOP Reference: L-1

Analyte	CAS Number	Project Quantitation Limit µg/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs µg/kg
Chlorobenzene	108-90-7	5.0	Not provided in method	5.0	0.084	5.0
1,3-Dichlorobenzene	541-73-1	5.0	Not provided in method	5.0	0.10	5.0
1,4-Dichlorobenzene	106-46-7	5.0	Not provided in method	5.0	0.15	5.0
1,2-Dichlorobenzene	95-50-1	5.0	Not provided in method	5.0	0.14	5.0
1,2,4-Trichlorobenzene	120-82-1	5.0	Not provided in method	5.0	0.19	5.0
1,2,3-Trichlorobenzene	87-61-6	5.0	Not provided in method	5.0	0.27	5.0

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: Aroclor PCBs
Concentration Level: Low
Analytical Method/SOP Reference: L-1

Analyte	CAS Number	Project Quantitation Limit µg/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs µg/kg
Aroclor-1016	12674-11-2	33	Not provided in method	33	2.8	33
Aroclor-1221	11104-28-2	33	Not provided in method	33	4.1	33
Aroclor-1232	11141-16-5	33	Not provided in method	33	3.2	33
Aroclor-1242	53469-21-9	33	Not provided in method	33	2.8	33
Aroclor-1248	12672-29-6	33	Not provided in method	33	2.4	33
Aroclor-1254	11097-69-1	33	Not provided in method	33	4.1	33
Aroclor-1260	11096-82-5	33	Not provided in method	33	2.9	33
Aroclor-1262	37324-23-5	33	Not provided in method	33	3.3	33
Aroclor-1268	11100-14-4	33	Not provided in method	33	3.3	33

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: Organochlorine Pesticides
Concentration Level: Low
Analytical Method/SOP Reference: L-2

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
2,4'-DDD	53-19-0	4	0.8	5	0.49	4
2,4'-DDE	3424-82-6	8	0.5	5	0.33	8
2,4-DDT	789-02-6	8	0.3	5	1.35	8
4,4'-DDD	72-54-8	4	1.5	5	0.38	4
4,4'-DDE	72-55-9	8	0.7	5	0.49	8
4,4'-DDT	50-29-3	8	0.3	5	2.36	8
Aldrin	309-00-2	4	0.6	10	0.53	4
alpha-BHC	319-84-6	4	1.3	10	0.54	4
alpha-Chlordane	5103-71-9	4	0.6	5	0.92	4
beta-BHC	319-85-7	4	0.6	10	0.40	4
delta-BHC	319-86-8	4	2.0	10	0.21	4
Dieldrin	60-57-1	4	0.5	5	1.22	4
Endosulfan I	959-98-8	40	Not provided in method	Not provided in method	4.45	40
Endosulfan II	33213-65-9	40	Not provided in method	Not provided in method	4.98	40
Endosulfan sulfate	1031-07-8	40	11	50	3.56	40
Endrin	72-20-8	8	0.4	5	0.58	8
Endrin aldehyde	7421-93-4	40	Not provided in method	Not provided in method	5.28	40
Endrin ketone	53494-70-5	40	1.6	5	4.19	40
gamma-BHC	58-89-9	4	0.7	10	0.68	4
gamma-Chlordane	5103-74-2	4	0.8	5	1.04	4
Heptachlor	76-44-8	20	Not provided in method	Not provided in method	1.47	20
Heptachlor epoxide B (Cis)	1024-57-3	4	0.3	5	0.90	4
Hexachlorobenzene	118-74-1	4	1.9	5	0.63	4
Methoxychlor	72-43-5	40	0.3	5	2.72	40
Nonachlor(cis)	5103-73-1	4	0.5	5	0.99	4
Nonachlor(trans)	39765-80-5	4	0.8	5	0.88	4
Oxychlordane	27304-13-8	4	0.5	10	0.54	4
Mirex	2385-85-5	4	Not provided in method	Not provided in method	0.67	4

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: Semivolatile Organics (SIM)
Concentration Level: Low
Analytical Method/SOP Reference: L-1

Analyte	CAS Number	Project Quantitation Limit µg/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs µg/kg
Naphthalene	91-20-3	3.3	Not provided in method	3.3	0.37	3.3
2-Methylnaphthalene	91-57-6	3.3	Not provided in method	3.3	0.26	3.3
1-Methylnaphthalene	90-12-0	3.3	Not provided in method	3.3	0.26	3.3
2,6-Dimethylnaphthalene	581-42-0	3.3	Not provided in method	3.3	0.27	3.3
2,3,5-Trimethylnaphthalene	2245-38-7	3.3	Not provided in method	3.3	0.39	3.3
1,1'-Biphenyl	92-52-4	3.3	Not provided in method	3.3	0.29	3.3
Acenaphthylene	208-96-8	3.3	Not provided in method	3.3	0.30	3.3
Acenaphthene	83-32-9	3.3	Not provided in method	3.3	0.26	3.3
Dibenzofuran	132-64-9	3.3	Not provided in method	Not provided in method	0.26	3.3
Fluorene	86-73-7	3.3	Not provided in method	3.3	0.33	3.3
Anthracene	120-12-7	3.3	Not provided in method	3.3	0.29	3.3
Phenanthrene	85-01-8	3.3	Not provided in method	3.3	0.25	3.3
1-Methylphenanthrene	832-69-9	3.3	Not provided in method	3.3	0.61	3.3
3,6-Dimethylphenanthrene	1576-67-6	3.3	Not provided in method	Not provided in method	0.45	3.3
Dibenzothiophene	135-65-0	3.3	Not provided in method	3.3	0.29	3.3
Fluoranthene	206-44-0	3.3	Not provided in method	3.3	0.44	3.3
Pyrene	129-00-0	3.3	Not provided in method	3.3	0.69	3.3
Benzo[a]anthracene	56-55-3	3.3	Not provided in method	3.3	0.39	3.3
Chrysene	218-01-9	3.3	Not provided in method	3.3	0.33	3.3
Benzo[b]fluoranthene	205-99-2	3.3	Not provided in method	3.3	0.46	3.3
Benzo[k]fluoranthene	207-08-9	3.3	Not provided in method	3.3	0.45	3.3
Benzo[e]pyrene	192-97-2	3.3	Not provided in method	3.3	0.41	3.3
Benzo[a]pyrene	50-32-8	3.3	Not provided in method	3.3	0.37	3.3

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: Semivolatile Organics (SIM)
Concentration Level: Low
Analytical Method/SOP Reference: L-1

Analyte	CAS Number	Project Quantitation Limit µg/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs µg/kg
Perylene	198-55-0	3.3	Not provided in method	3.3	0.35	3.3
Indeno[1,2,3-c,d]-pyrene	193-39-5	3.3	Not provided in method	3.3	0.54	3.3
Dibenzo[a,h]anthracene	53-70-3	3.3	Not provided in method	3.3	0.54	3.3
Benzo[g,h,i]perylene	191-24-2	3.3	Not provided in method	3.3	0.71	3.3
1-Methylanthracene	610-48-0	3.3	Not provided in method	Not provided in method	0.39	3.3
1-Methylfluoranthene	25889-60-5	3.3	Not provided in method	Not provided in method	0.63	3.3
1-Methylpyrene	2381-21-7	3.3	Not provided in method	Not provided in method	0.55	3.3

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: PCDD/PCDFs
Concentration Level: Low
Analytical Method/SOP Reference: L-8

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
2,3,7,8-TCDD	1746-01-6	0.5	Not provided in method	1	0.08	0.5
1,2,3,7,8-PeCDD	40321-76-4	2.5	Not provided in method	5	0.13	2.5
1,2,3,6,7,8-HxCDD	57653-85-7	2.5	Not provided in method	5	0.19	2.5
1,2,3,4,7,8-HxCDD	39227-28-6	2.5	Not provided in method	5	0.23	2.5
1,2,3,7,8,9-HxCDD	19408-74-3	2.5	Not provided in method	5	0.19	2.5
1,2,3,4,6,7,8-HpCDD	35822-46-9	2.5	Not provided in method	5	0.12	2.5
OCDD	3268-87-9	5.0	Not provided in method	10	0.20	5.0
2,3,7,8-TCDF	51207-31-9	0.5	Not provided in method	1	0.04	0.5
1,2,3,7,8-PeCDF	57117-41-6	2.5	Not provided in method	5	0.14	2.5
2,3,4,7,8-PeCDF	57117-31-4	2.5	Not provided in method	5	0.13	2.5
1,2,3,6,7,8-HxCDF	57117-44-9	2.5	Not provided in method	5	0.08	2.5
1,2,3,7,8,9-HxCDF	72918-21-9	2.5	Not provided in method	5	0.11	2.5
1,2,3,4,7,8-HxCDF	70648-26-9	2.5	Not provided in method	5	0.12	2.5
2,3,4,6,7,8-HxCDF	60851-34-5	2.5	Not provided in method	5	0.12	2.5
1,2,3,4,6,7,8-HpCDF	67562-39-4	2.5	Not provided in method	5	0.14	2.5
1,2,3,4,7,8,9-HpCDF	55673-89-7	2.5	Not provided in method	5	0.08	2.5
OCDF	39001-02-0	5.0	Not provided in method	10	0.49	5.0
Total TCDD	41903-57-5	0.5	Not provided in method	Not provided in method	NA	NA
Total PeCDD	36088-22-9	2.5	Not provided in method	Not provided in method	NA	NA
Total HxCDD	34465-46-8	2.5	Not provided in method	Not provided in method	NA	NA
Total HpCDD	37871-00-4	2.5	Not provided in method	Not provided in method	NA	NA
Total TCDF	55722-27-5	0.5	Not provided in method	Not provided in method	NA	NA
Total PeCDF	30402-15-4	2.5	Not provided in method	Not provided in method	NA	NA
Total HxCDF	55684-94-1	2.5	Not provided in method	Not provided in method	NA	NA
Total HpCDF	38998-75-3	2.5	Not provided in method	Not provided in method	NA	NA

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
PCB1	2051-60-7	0.5	8	20	0.11	0.5
PCB2	2051-61-8	0.5	0.4	1	0.16	0.5
PCB3	2051-62-9	0.5	9	20	0.12	0.5
PCB4/10	13029-08-8/33146-45-1	1.0	Not provided in method	Not provided in method	0.12	1.0
PCB6	25569-80-6	1.0	1	5	0.08	1.0
PCB5/8	16605-91-7/34883-43-7	1.0	Not provided in method	Not provided in method	0.23	1.0
PCB7/9	33284-50-3/34883-39-1	1.0	2	5	0.13	1.0
PCB11	2050-67-1	1.0	10	20	0.49	1.0
PCB12/13	2974-92-7/2974-90-5	1.0	3	10	0.46	1.0
PCB14	34883-41-5	1.0	3	10	0.10	1.0
PCB15	2050-68-2	1.0	18	50	0.15	1.0
PCB16/32	38444-78-9/38444-77-8	0.5	Not provided in method	Not provided in method	0.13	0.5
PCB17	37680-66-3	0.5	9	20	0.05	0.5
PCB18	37680-65-2	0.5	17	50	0.09	0.5
PCB19	38444-73-4	0.5	4	10	0.06	0.5
PCB20/21/33	38444-84-7/ 55702-46-0/38444-86-9	1.0	Not provided in method	Not provided in method	0.73	1.0
PCB22	38444-85-8	0.5	9	20	0.26	0.5
PCB23	55720-44-0	0.5	5	20	0.11	0.5
PCB24/27	55702-45-9/38444-76-7	0.5	Not provided in method	Not provided in method	0.10	0.5
PCB25	55712-37-3	0.5	5	20	0.21	0.5
PCB26	38444-81-4	0.5	8	20	0.22	0.5
PCB28	7012-37-5	0.5	19	50	0.14	0.5
PCB29	15862-07-4	0.5	8	20	0.21	0.5

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
PCB30	35693-92-6	0.5	17	50	0.13	0.5
PCB31	16606-02-3	0.5	15	50	0.25	0.5
PCB34	37680-68-5	0.5	7	20	0.19	0.5
PCB35	37680-69-6	0.5	8	20	0.18	0.5
PCB36	38444-87-0	0.5	8	20	0.19	0.5
PCB37	38444-90-5	0.5	13	50	0.12	0.5
PCB38	53555-66-1	0.5	8	20	0.16	0.5
PCB39	38444-88-1	0.5	9	20	0.15	0.5
PCB40	38444-93-8	0.5	12	50	0.15	0.5
PCB41/64/71/ 72	52663-59-9/52663-58-8/ 41464-46-4/41464-42-0	0.5	Not provided in method	Not provided in method	0.34	0.5
PCB42/59	36559-22-5/74472-33-6	0.5	6	20	0.28	0.5
PCB43/49	70362-46-8/41464-40-8	0.5	Not provided in method	Not provided in method	0.21	0.5
PCB44	41464-39-5	0.5	19	50	0.17	0.5
PCB45	70362-45-7	0.5	5	20	0.12	0.5
PCB46	41464-47-5	0.5	10	20	0.15	0.5
PCB47	2437-79-8	0.5	19	50	0.15	0.5
PCB48/75	70362-47-9/32598-12-2	0.5	Not provided in method	Not provided in method	0.25	0.5
PCB50	62796-65-0	0.5	6	20	0.21	0.5
PCB51	68194-04-7	0.5	5	20	0.10	0.5
PCB52/69	35693-99-3/60233-24-1	0.5	Not provided in method	Not provided in method	0.10	0.5
PCB53	41464-41-9	0.5	6	20	0.07	0.5
PCB54	15968-05-5	0.5	12	50	0.08	0.5
PCB55	74338-24-2	0.5	12	50	0.09	0.5

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
PCB56/60	41464-43-1/33025-41-1	0.5	Not provided in method	Not provided in method	0.38	0.5
PCB57	70424-67-8	0.5	12	50	0.14	0.5
PCB58	41464-49-7	0.5	13	50	0.09	0.5
PCB61/70	33284-53-6/32598-11-1	0.5	17	50	0.14	0.5
PCB62	54230-22-7	0.5	6	20	0.15	0.5
PCB63	74472-34-7	0.5	14	50	0.08	0.5
PCB65	33284-54-7	0.5	19	50	0.17	0.5
PCB67	73575-53-8	0.5	15	50	0.17	0.5
PCB68	73575-52-7	0.5	15	50	0.18	0.5
PCB73	74338-23-1	0.5	16	50	0.08	0.5
PCB74	32690-93-0	0.5	17	50	0.37	0.5
PCB76/66	70362-48-0/32598-10-0	0.5	Not provided in method	Not provided in method	0.16	0.5
PCB77	32598-13-3	0.5	17	50	0.06	0.5
PCB78	70362-49-1	0.5	17	50	0.10	0.5
PCB79	41464-48-6	0.5	17	50	0.27	0.5
PCB80	33284-52-5	0.5	18	50	0.08	0.5
PCB81	70362-50-4	0.5	18	50	0.10	0.5
PCB82	52663-62-4	0.5	13	50	0.26	0.5
PCB83	60145-20-2	0.5	22	50	0.05	0.5
PCB84/92	52663-60-2/52663-61-3	0.5	12	50	0.17	0.5
PCB85/116	65510-45-4/18259-05-7	0.5	10	20	0.19	0.5
PCB86	55312-69-1	0.5	15	50	0.09	0.5
PCB87/117/125	38380-02-8/ 68194-11-6/74472-39-2	0.5	Not provided in method	Not provided in method	0.38	0.5

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
PCB88/91	55215-17-3/68194-05-8	0.5	12	50	0.22	0.5
PCB89	73575-57-2	0.5	19	50	0.10	0.5
PCB90/101	68194-07-0/37680-73-2	0.5	24	100	0.19	0.5
PCB93	73575-56-1	0.5	22	50	0.31	0.5
PCB94	73575-55-0	0.5	12	50	0.13	0.5
PCB95/98/102	38379-99-6/ 60233-25-2/68194-06-9	0.5	22	50	0.18	0.5
PCB96	73575-54-9	0.5	21	50	0.07	0.5
PCB97	41464-51-1	0.5	15	50	0.11	0.5
PCB99	38380-01-7	0.5	22	50	0.12	0.5
PCB100	39485-83-1	0.5	22	50	0.12	0.5
PCB103	60145-21-3	0.5	23	50	0.09	0.5
PCB104	56558-16-8	0.5	23	50	0.06	0.5
PCB105	32598-14-4	0.5	11	20	0.14	0.5
PCB106/118	70424-69-0/31508-00-6	0.5	Not provided in method	Not provided in method	0.13	0.5
PCB107/109	70424-68-9/74472-35-8	0.5	Not provided in method	Not provided in method	0.38	0.5
PCB108/112	70362-41-3/74472-36-9	0.5	Not provided in method	Not provided in method	0.13	0.5
PCB110	38380-03-9	0.5	24	100	0.08	0.5
PCB111/115	39635-32-0/74472-38-1	0.5	24	100	0.13	0.5
PCB113	68194-10-5	0.5	24	100	0.17	0.5
PCB114	74472-37-0	0.5	12	50	0.04	0.5
PCB119	56558-17-9	0.5	15	50	0.11	0.5
PCB120	68194-12-7	0.5	15	50	0.07	0.5
PCB121	56558-18-0	0.5	21	50	0.12	0.5

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
PCB122	76842-07-4	0.5	12	50	0.15	0.5
PCB123	65510-44-3	0.5	15	50	0.13	0.5
PCB124	70424-70-3	0.5	27	100	0.17	0.5
PCB126	57465-28-8	0.5	14	50	0.07	0.5
PCB127	39635-33-1	0.5	28	100	0.09	0.5
PCB128/162	38380-07-3/39635-34-2	0.5	Not provided in method	Not provided in method	0.13	0.5
PCB129	55215-18-4	0.5	21	50	0.17	0.5
PCB130	52663-66-8	0.5	14	50	0.20	0.5
PCB131	61798-70-7	0.5	12	50	0.13	0.5
PCB132/161	38380-05-1/74472-43-8	0.5	Not provided in method	Not provided in method	0.22	0.5
PCB133/142	35694-04-3/41411-61-4	0.5	Not provided in method	Not provided in method	0.13	0.5
PCB134/143	52704-70-8/68194-15-0	0.5	13	50	0.08	0.5
PCB135	52744-13-5	0.5	11	50	0.10	0.5
PCB136	38411-22-2	0.5	9	20	0.12	0.5
PCB137	35694-06-5	0.5	30	100	0.12	0.5
PCB138/163/164	35065-28-2/ 74472-44-9/74472-45-0	0.5	Not provided in method	Not provided in method	0.28	0.5
PCB139/149	56030-56-9/38380-04-0	0.5	Not provided in method	Not provided in method	0.13	0.5
PCB140	59291-64-4	0.5	20	50	0.44	0.5
PCB141	52712-04-6	0.5	9	20	0.31	0.5
PCB144	68194-14-9	0.5	17	50	0.09	0.5
PCB145	74472-40-5	0.5	32	100	0.16	0.5
PCB146/165	51908-16-8/74472-46-1	0.5	Not provided in method	Not provided in method	0.21	0.5
PCB147	68194-13-8	0.5	18	50	0.08	0.5

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
PCB148	74472-41-6	0.5	32	100	0.09	0.5
PCB150	68194-08-1	0.5	33	100	0.40	0.5
PCB151	52663-63-5	0.5	11	50	0.33	0.5
PCB152	68194-09-2	0.5	24	100	0.11	0.5
PCB153	35065-27-1	0.5	13	50	0.13	0.5
PCB154	60145-22-4	0.5	11	50	0.11	0.5
PCB155	33979-03-2	0.5	34	100	0.06	0.5
PCB156	38380-08-4	0.5	13	50	0.09	0.5
PCB157	69782-90-7	0.5	13	50	0.12	0.5
PCB158/160	74472-42-7/41411-62-5	0.5	Not provided in method	Not provided in method	0.12	0.5
PCB159	39635-35-3	0.5	35	100	0.06	0.5
PCB166	41411-63-6	0.5	12	50	0.13	0.5
PCB167	52663-72-6	0.5	11	50	0.07	0.5
PCB168	59291-65-5	0.5	13	50	0.10	0.5
PCB169	32774-16-6	0.5	16	50	0.16	0.5
PCB170	35065-30-6	0.5	16	50	0.09	0.5
PCB171	52663-71-5	0.5	37	100	0.13	0.5
PCB172	52663-74-8	0.5	38	100	0.14	0.5
PCB173	68194-16-1	0.5	37	100	0.14	0.5
PCB174	38411-25-5	0.5	19	50	0.32	0.5
PCB175	40186-70-7	0.5	38	100	0.10	0.5
PCB176	52663-65-7	0.5	39	100	0.11	0.5
PCB177	52663-70-4	0.5	14	50	0.16	0.5
PCB178	52663-67-9	0.5	22	50	0.13	0.5

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
PCB179	52663-64-6	0.5	23	50	0.10	0.5
PCB180	35065-29-3	0.5	14	50	0.14	0.5
PCB181	74472-47-2	0.5	40	100	0.09	0.5
PCB182/187	60145-23-5/52663-68-0	0.5	Not provided in method	Not provided in method	0.19	0.5
PCB183	52663-69-1	0.5	40	100	0.10	0.5
PCB184	74472-48-3	0.5	40	100	0.10	0.5
PCB185	52712-05-7	0.5	40	100	0.08	0.5
PCB186	74472-49-4	0.5	41	100	0.08	0.5
PCB188	74487-85-7	0.5	23	50	0.12	0.5
PCB189	39635-31-9	0.5	18	50	0.09	0.5
PCB190	41411-64-7	0.5	23	50	0.05	0.5
PCB191	74472-50-7	0.5	42	100	0.06	0.5
PCB192	74472-51-8	0.5	42	100	0.14	0.5
PCB193	69782-91-8	0.5	14	50	0.10	0.5
PCB194	35694-08-7	0.5	17	50	0.11	0.5
PCB195	52663-78-2	0.5	43	100	0.13	0.5
PCB196/203	42740-50-1/52663-76-0	0.5	Not provided in method	Not provided in method	0.17	0.5
PCB197	33091-17-7	0.5	25	100	0.09	0.5
PCB198	68194-17-2	0.5	20	50	0.17	0.5
PCB199	52663-75-9	0.5	20	50	0.15	0.5
PCB200	52663-73-7	0.5	25	100	0.06	0.5
PCB201	40186-71-8	0.5	44	100	0.10	0.5
PCB202	2136-99-4	0.5	44	100	0.14	0.5
PCB204	74472-52-9	0.5	45	100	0.15	0.5

See the last page of Work sheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: PCB Congeners
Concentration Level: Low
Analytical Method/SOP Reference: L-9

Analyte	CAS Number	Project Quantitation Limit ng/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs ng/kg
PCB205	74472-53-0	0.5	45	100	0.10	0.5
PCB206	40186-72-9	0.5	45	100	0.20	0.5
PCB207	52663-79-3	0.5	45	100	0.11	0.5
PCB208	52663-77-1	0.5	46	100	0.06	0.5
PCB209	2051-24-3	0.5	15	50	0.06	0.5

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: Chlorinated Herbicides
Concentration Level: Low
Analytical Method/SOP Reference: L-10

Analyte	CAS Number	Project Quantitation Limit µg/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs µg/kg
2,4-D	94-75-7	240	0.11	Not provided in method	5.6	240
2,4-DB	94-82-6	180	Not provided in method	Not provided in method	7.3	180
2,4,5-TP(Silvex)	93-72-6	100	0.28	Not provided in method	0.45	100
2,4,5-T	93-76-5	100	Not provided in method	Not provided in method	1.5	100

See the last page of Worksheet #15-2 for footnotes.

QAPP Worksheet #15-2
Reference Limits and Evaluation – HSM Particulate (Continued)

Matrix: HSM Particulate
Analytical Group: Miscellaneous
Concentration Level: Low
Analytical Method/SOP Reference: L-7, L-11, and L-13

Analyte	CAS Number	Project Quantitation Limit mg/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs mg/kg	Method QLs mg/kg	MDLs mg/kg	QLs mg/kg
Cyanide	57-12-5	0.5	Not provided in method	0.5	0.087	0.5
TEPH	TEPH	20	10	Not provided in method	2.4	20
TOC	TOC	500	Not provided in method	Not provided in method	110	500

Notes:

[a] Analytical MDLs and QLs are those documented in validated methods.
[b] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

CAS = Chemical Abstracts Service
HSM = high-solids mass
MDL = method detection limit
mg/kg = milligrams per kilogram
NA = not applicable
ng/kg = nanograms per kilogram
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/ polychlorinated dibenzofurans
QL = quantitation limit
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TBD = to be determined
TEPH = total extractable petroleum hydrocarbon
TOC = total organic carbon
µg/kg = micrograms per kilogram

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate

Matrix: LSM Particulate
Analytical Group: Semivolatile Organics
Concentration Level: Low
Analytical Method/SOP Reference: L-1, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] µg/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs[d] µg/kg
Benzaldehyde	100-52-7	2550 - 51000	Not provided in method	170	2000	6700
Phenol	108-95-2	2550 -51000	Not provided in method	170	2045	6700
bis(2-Chloroethyl) ether	111-44-4	2550 - 51000	Not provided in method	170	1839	6700
2-Chlorophenol	95-57-8	2550 -51000	Not provided in method	170	2103	6700
2-Methylphenol	95-48-7	2550 -51000	Not provided in method	170	2103	6700
2,2'-oxybis(1-Chloropropane)	108-60-1	2550 -51000	Not provided in method	170	1699	6700
Acetophenone	98-86-2	2550 -51000	Not provided in method	170	1838	6700
4-Methylphenol	106-44-5	2550 -51000	Not provided in method	170	2040	6700
N-Nitroso-di-n-propylamine	621-64-7	2550 -51000	Not provided in method	170	2131	6700
Hexachloroethane	67-72-1	2550 -51000	Not provided in method	170	1359	6700
Nitrobenzene	98-95-3	2550 -51000	Not provided in method	170	1774	6700
Isophorone	78-59-1	2550 -51000	Not provided in method	170	1919	6700
2-Nitrophenol	88-75-5	2550 -51000	Not provided in method	170	2134	6700
2,4-Dimethylphenol	105-67-9	2550 -51000	Not provided in method	170	2027	6700
bis(2-Chloroethoxy) methane	111-91-1	2550 -51000	Not provided in method	170	1970	6700
2,4-Dichlorophenol	120-83-2	2550 -51000	Not provided in method	170	2333	6700
4-Chloroaniline	106-47-8	2550 -51000	Not provided in method	170	1879	6700
Hexachlorobutadiene	87-68-3	2550 -51000	Not provided in method	170	1590	6700
Caprolactam	105-60-2	2550 -51000	Not provided in method	170	2254	6700
4-Chloro-3-methyphenol	59-50-7	2550 -51000	Not provided in method	170	2353	6700
Hexachlorocyclopentadiene	77-47-4	2550 -51000	Not provided in method	170	2607	6700
2,4,6-Trichlorophenol	88-06-2	2550 -51000	Not provided in method	170	2119	6700
2,4,5-Trichlorophenol	95-95-4	2550 -51000	Not provided in method	170	2417	6700
1,1'-Biphenyl	92-52-4	2550 -51000	Not provided in method	170	1900	6700

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: Semivolatile Organics
Concentration Level: Low
Analytical Method/SOP Reference: L-1, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] µg/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs[d] µg/kg
2-Chloronapthalene	91-58-7	2550 - 51000	Not provided in method	170	1880	6700
2-Nitroaniline	88-74-4	4950 - 100000	Not provided in method	330	4751	13000
Dimethylphthalate	131-11-3	2550 -51000	Not provided in method	170	2243	6700
2,6-Dinitrotoluene	606-20-2	2550 -51000	Not provided in method	170	2340	6700
3-Nitroaniline	99-09-2	4950 - 100000	Not provided in method	330	2741	13000
2,4-Dinitrophenol	51-28-5	4950 - 100000	Not provided in method	330	514	13000
4-Nitrophenol	100-02-7	4950 - 100000	Not provided in method	330	5188	13000
Dibenzofuran	132-64-9	2550 -51000	Not provided in method	170	2013	6700
2,4-Dinitrotoluene	121-14-2	2550 -51000	Not provided in method	170	2694	6700
Diethylphthalate	84-66-2	2550 -51000	Not provided in method	170	2221	6700
4-Chlorophenyl-phenylether	7005-72-3	2550 -51000	Not provided in method	170	2313	6700
4-Nitroaniline	100-01-6	4950 - 100000	Not provided in method	330	4328	13000
4,6-Dinitro-2-methylphenol	534-52-1	4950 - 100000	Not provided in method	330	1719	13000
N-Nitrosodiphenylamine	86-30-6	2550 -51000	Not provided in method	170	2022	6700
1,2,4,5-Tetrachlorobenzene	95-94-3	2550 -51000	Not provided in method	170	1792	6700
4-Bromophenyl -phenylether	101-55-3	2550 -51000	Not provided in method	170	2071	6700
Hexachlorobenzene	118-74-1	2550 -51000	Not provided in method	170	1997	6700
Atrazine	1912-24-9	2550 -51000	Not provided in method	170	2219	6700
Penta chlorophenol	87-86-5	4950 - 100000	Not provided in method	330	3021	13000
Carbazole	86-74-8	2550 -51000	Not provided in method	170	2002	6700
Di-n-butylphthalate	84-74-2	2550 -51000	Not provided in method	170	1845	6700
Butylbenzylphthalate	85-68-7	2550 -51000	Not provided in method	170	2078	6700
3,3'-Dichlorobenzid ine	91-94-1	2550 -51000	Not provided in method	170	1561	6700
bis-(2-Ethylhexyl)phthalate	117-81-7	2550 -51000	Not provided in method	170	2201	6700
Di-n-octylphthalate	117-84-0	2550 -51000	Not provided in method	170	1292	6700
2,3,4,6-Tetrachlorphenol	58-90-2	2550 -51000	Not provided in method	170	3362	6700

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: Aroclor PCBs
Concentration Level: Low
Analytical Method/SOP Reference: L-1, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] µg/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs[d] µg/kg
Aroclor-1016	12674-11-2	2500 - 50000	Not provided in method	33	2500	6600
Aroclor-1221	11104-28-2	2500 - 50000	Not provided in method	33	1600	6600
Aroclor-1232	11141-16-5	2500 - 50000	Not provided in method	33	1500	6600
Aroclor-1242	53469-21-9	2500 - 50000	Not provided in method	33	1600	6600
Aroclor-1248	12672-29-6	2500 - 50000	Not provided in method	33	5700	6600
Aroclor-1254	11097-69-1	2500 - 50000	Not provided in method	33	400	6600
Aroclor-1260	11096-82-5	2500 - 50000	Not provided in method	33	1700	6600
Aroclor-1262	37324-23-5	2500 - 50000	Not provided in method	33	1300	6600
Aroclor-1268	11100-14-4	2500 - 50000	Not provided in method	33	980	6600

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: Organochlorine Pesticides
Concentration Level: Low
Analytical Method/SOP Reference: L-2, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
2,4'-DDD	53-19-0	107	0.8	5	15.3	107
2,4'-DDE	3424-82-6	213	0.5	5	32.4	213
2,4-DDT	789-02-6	213	0.3	5	28.5	213
4,4'-DDD	72-54-8	107	1.5	5	19.6	107
4,4'-DDE	72-55-9	213	0.7	5	17.3	213
4,4'-DDT	50-29-3	213	0.3	5	33.0	213
Aldrin	309-00-2	107	0.6	10	13.3	107
alpha-BHC	319-84-6	107	1.3	10	12.0	107
alpha-Chlordane	5103-71-9	107	0.6	5	26.8	107
beta-BHC	319-85-7	107	0.6	10	13.0	107
delta-BHC	319-86-8	107	2.0	10	5.41	107
Dieldrin	60-57-1	107	0.5	5	16.0	107
Endosulfan I	959-98-8	1067	Not provided in method	Not provided in method	76.8	1067
Endosulfan II	33213-65-9	1067	Not provided in method	Not provided in method	107	1067
Endosulfan sulfate	1031-07-8	1067	11	50	143	1067
Endrin	72-20-8	213	0.4	5	53.6	213
Endrin aldehyde	7421-93-4	1067	Not provided in method	Not provided in method	229	1067
Endrin ketone	53494-70-5	1067	1.6	5	225	1067
gamma-BHC	58-89-9	107	0.7	10	10.3	107
gamma-Chlordane	5103-74-2	107	0.8	5	22.62	107
Heptachlor	76-44-8	533	Not provided in method	Not provided in method	48.0	533
Heptachlor epoxide B (Cis)	1024-57-3	107	0.3	5	14.9	107
Hexachlorobenzene	118-74-1	107	1.9	5	12.32	107
Methoxychlor	72-43-5	1067	0.3	5	158	1067
Nonachlor(cis)	5103-73-1	107	0.5	5	29.6	107
Nonachlor(trans)	39765-80-5	107	0.8	5	20.0	107
Oxychlordane	27304-13-8	107	0.5	10	17.0	107
Mirex	2385-85-5	107	Not provided in method	Not provided in method	26.7	107

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: Semivolatile Organics (SIM)
Concentration Level: Low
Analytical Method/SOP Reference: L-1, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] µg/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs[d] µg/kg
Naphthalene	91-20-3	10 – 200	Not provided in method	3.3	9.71	27
2-Methylnaphthalene	91-57-6	10 – 200	Not provided in method	3.3	11.6	27
1-Methylnaphthalene	90-12-0	10 – 200	Not provided in method	3.3	7.73	27
2,6-Dimethylnaphthalene	581-42-0	10 – 200	Not provided in method	3.3	18.4	27
2,3,5-Trimethylnaphthalene	2245-38-7	10 – 200	Not provided in method	3.3	39.0	54
1,1'-Biphenyl	92-52-4	10 – 200	Not provided in method	3.3	7.99	27
Acenaphthylene	208-96-8	10 – 200	Not provided in method	3.3	7.58	27
Acenaphthene	83-32-9	10 – 200	Not provided in method	3.3	12.6	27
Dibenzofuran	132-64-9	10 – 200	Not provided in method	Not provided in method	20.8	27
Fluorene	86-73-7	10 – 200	Not provided in method	3.3	14.7	27
Anthracene	120-12-7	10 – 200	Not provided in method	3.3	7.36	27
Phenanthrene	85-01-8	20 – 400	Not provided in method	3.3	44.6	54
1-Methylphenanthrene	832-69-9	10 – 200	Not provided in method	3.3	8.01	27
3,6-Dimethylphenanthrene	1576-67-6	10 – 200	Not provided in method	Not provided in method	6.41	27
Dibenzothiophene	135-65-0	10 – 200	Not provided in method	3.3	19.4	27
Fluoranthene	206-44-0	10 – 200	Not provided in method	3.3	10.8	27
Pyrene	129-00-0	10 – 200	Not provided in method	3.3	9.48	27
Benzo[a]anthracene	56-55-3	10 – 200	Not provided in method	3.3	5.00	27
Chrysene	218-01-9	10 – 200	Not provided in method	3.3	3.21	27
Benzo[b]fluoranthene	205-99-2	10 – 200	Not provided in method	3.3	3.05	27
Benzo[k]fluoranthene	207-08-9	10 – 200	Not provided in method	3.3	3.42	27
Benzo[e]pyrene	192-97-2	10 – 200	Not provided in method	3.3	3.67	27
Benzo[a]pyrene	50-32-8	10 – 200	Not provided in method	3.3	3.81	27

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: Semivolatile Organics (SIM)
Concentration Level: Low
Analytical Method/SOP Reference: L-1, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit [c] µg/kg	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs [d] µg/kg
Perylene	198-55-0	10 – 200	Not provided in method	3.3	2.92	27
Indeno[1,2,3-c,d]-pyrene	193-39-5	10 – 200	Not provided in method	3.3	2.70	27
Dibenzo[a,h]anthracene	53-70-3	10 – 200	Not provided in method	3.3	2.82	27
Benzo[g,h,i]perylene	191-24-2	10 – 200	Not provided in method	3.3	3.30	27
1-Methylanthracene	610-48-0	10 – 200	Not provided in method	Not provided in method	13.5	27
1-Methylfluoranthene	25889-60-5	10 – 200	Not provided in method	Not provided in method	5.02	27
1-Methylpyrene	2381-21-7	10 – 200	Not provided in method	Not provided in method	5.53	27

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCDD/PCDFs (Primary)
Concentration Level: Low
Analytical Method/SOP Referenc e: L-8, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
2,3,7,8-TCDD	1746-01-6	1.25 – 25	Not provided in method	1	0.4	4
1,2,3,7,8-PeCDD	40321-76-4	6.25 – 125	Not provided in method	5	1.5	17
1,2,3,6,7,8-HxCDD	57653-85-7	6.25 – 125	Not provided in method	5	1.7	17
1,2,3,4,7,8-HxCDD	39227-28-6	6.25 – 125	Not provided in method	5	1.5	17
1,2,3,7,8,9-HxCDD	19408-74-3	6.25 – 125	Not provided in method	5	1.8	17
1,2,3,4,6,7,8-HpCDD	35822-46-9	6.25 – 125	Not provided in method	5	1.5	17
OCDD	3268-87-9	12.5 – 250	Not provided in method	10	3.8	34
2,3,7,8-TCDF	51207-31-9	1.25 – 25	Not provided in method	1	0.6	4
1,2,3,7,8-PeCDF	57117-41-6	6.25 – 125	Not provided in method	5	1.3	17
2,3,4,7,8-PeCDF	57117-31-4	6.25 –125	Not provided in method	5	0.6	17
1,2,3,6,7,8-HxCDF	57117-44-9	6.25 – 125	Not provided in method	5	1.1	17
1,2,3,7,8,9-HxCDF	72918-21-9	6.25 – 125	Not provided in method	5	0.9	17
1,2,3,4,7,8-HxCDF	70648-26-9	6.25 – 125	Not provided in method	5	1.3	17
2,3,4,6,7,8-HxCDF	60851-34-5	6.25 – 125	Not provided in method	5	1.0	17
1,2,3,4,6,7,8-HpCDF	67562-39-4	6.25 – 125	Not provided in method	5	1.0	17
1,2,3,4,7,8,9-HpCDF	55673-89-7	6.25 – 125	Not provided in method	5	1.7	17
OCDF	39001-02-0	12.5 – 250	Not provided in method	10	1.3	34
Total TCDD	41903-57-5	1.25 – 25	Not provided in method	Not provided in method	NA	NA
Total PeCDD	36088-22-9	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total HxCDD	34465-46-8	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total HpCDD	37871-00-4	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total TCDF	55722-27-5	1.25 – 25	Not provided in method	Not provided in method	NA	NA
Total PeCDF	30402-15-4	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total HxCDF	55684-94-1	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total HpCDF	38998-75-3	6.25 – 125	Not provided in method	Not provided in method	NA	NA

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCDD/PCDFs (Secondary)
Concentration Level: Low
Analytical Method/SOP Reference: L-8, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
2,3,7,8-TCDD	1746-01-6	1.25 – 25	Not provided in method	1	0.77	4
1,2,3,7,8-PeCDD	40321-76-4	6.25 – 125	Not provided in method	5	1.23	17
1,2,3,6,7,8-HxCDD	57653-85-7	6.25 – 125	Not provided in method	5	1.63	17
1,2,3,4,7,8-HxCDD	39227-28-6	6.25 – 125	Not provided in method	5	2.09	17
1,2,3,7,8,9-HxCDD	19408-74-3	6.25 – 125	Not provided in method	5	1.71	17
1,2,3,4,6,7,8-HpCDD	35822-46-9	6.25 – 125	Not provided in method	5	1.70	17
OCDD	3268-87-9	12.5 – 250	Not provided in method	10	5.56	34
2,3,7,8-TCDF	51207-31-9	1.25 – 25	Not provided in method	1	0.61	4
1,2,3,7,8-PeCDF	57117-41-6	6.25 – 125	Not provided in method	5	2.10	17
2,3,4,7,8-PeCDF	57117-31-4	6.25 –125	Not provided in method	5	1.45	17
1,2,3,6,7,8-HxCDF	57117-44-9	6.25 – 125	Not provided in method	5	1.88	17
1,2,3,7,8,9-HxCDF	72918-21-9	6.25 – 125	Not provided in method	5	2.57	17
1,2,3,4,7,8-HxCDF	70648-26-9	6.25 – 125	Not provided in method	5	3.09	17
2,3,4,6,7,8-HxCDF	60851-34-5	6.25 – 125	Not provided in method	5	2.22	17
1,2,3,4,6,7,8-HpCDF	67562-39-4	6.25 – 125	Not provided in method	5	1.24	17
1,2,3,4,7,8,9-HpCDF	55673-89-7	6.25 – 125	Not provided in method	5	1.55	17
OCDF	39001-02-0	12.5 – 250	Not provided in method	10	5.40	34
Total TCDD	41903-57-5	1.25 – 25	Not provided in method	Not provided in method	NA	NA
Total PeCDD	36088-22-9	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total HxCDD	34465-46-8	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total HpCDD	37871-00-4	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total TCDF	55722-27-5	1.25 – 25	Not provided in method	Not provided in method	NA	NA
Total PeCDF	30402-15-4	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total HxCDF	55684-94-1	6.25 – 125	Not provided in method	Not provided in method	NA	NA
Total HpCDF	38998-75-3	6.25 – 125	Not provided in method	Not provided in method	NA	NA

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Primary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB1	2051-60-7	2.5 – 50	8	20	1.53	6.67
PCB2	2051-61-8	2.5 – 50	0.4	1	0.88	6.67
PCB3	2051-62-9	2.5 – 50	9	20	0.81	6.67
PCB4/10	13029-08-8/33146-45-1	5 – 100	Not provided in method	Not provided in method	3.38	13.3
PCB6	25569-80-6	5 – 100	1	5	3.19	13.3
PCB5/8	16605-91-7/34883-43-7	5 – 100	Not provided in method	Not provided in method	8.82	13.3
PCB7/9	33284-50-3/34883-39-1	5 – 100	2	5	4.45	13.3
PCB11	2050-67-1	5 – 100	10	20	18.18	20
PCB12/13	2974-92-7/2974-90-5	5 – 100	3	10	4.90	13.3
PCB14	34883-41-5	5 – 100	3	10	2.22	13.3
PCB15	2050-68-2	5 – 100	18	50	1.99	13.3
PCB16/32	38444-78-9/38444-77-8	2.5 – 50	Not provided in method	Not provided in method	2.16	6.67
PCB17	37680-66-3	2.5 – 50	9	20	1.13	6.67
PCB18	37680-65-2	2.5 – 50	17	50	1.16	6.67
PCB19	38444-73-4	2.5 – 50	4	10	1.10	6.67
PCB20/21/33	38444-84-7/ 55702-46-0/38444-86-9	2.5 – 50	Not provided in method	Not provided in method	2.12	6.67
PCB22	38444-85-8	2.5 – 50	9	20	1.97	6.67
PCB23	55720-44-0	2.5 – 50	5	20	2.03	6.67
PCB24/27	55702-45-9/38444-76-7	2.5 – 50	Not provided in method	Not provided in method	1.74	6.67
PCB25	55712-37-3	2.5 – 50	5	20	1.91	6.67
PCB26	38444-81-4	2.5 – 50	8	20	1.36	6.67
PCB28	7012-37-5	2.5 – 50	19	50	2.12	6.67
PCB29	15862-07-4	2.5 – 50	8	20	1.40	6.67

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Primary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB30	35693-92-6	2.5 – 50	17	50	0.87	6.67
PCB31	16606-02-3	2.5 – 50	15	50	2.05	6.67
PCB34	37680-68-5	2.5 – 50	7	20	1.16	6.67
PCB35	37680-69-6	2.5 – 50	8	20	0.93	6.67
PCB36	38444-87-0	2.5 – 50	8	20	1.11	6.67
PCB37	38444-90-5	2.5 – 50	13	50	1.48	6.67
PCB38	53555-66-1	2.5 – 50	8	20	1.48	6.67
PCB39	38444-88-1	2.5 – 50	9	20	1.17	6.67
PCB40	38444-93-8	2.5 – 50	12	50	1.39	6.67
PCB41/64/71/72	52663-59-9/52663-58-8/ 41464-46-4/41464-42-0	2.5 – 50	Not provided in method	Not provided in method	2.61	6.67
PCB42/59	36559-22-5/74472-33-6	2.5 – 50	6	20	1.39	6.67
PCB43/49	70362-46-8/41464-40-8	2.5 – 50	Not provided in method	Not provided in method	2.90	6.67
PCB44	41464-39-5	2.5 – 50	19	50	1.38	6.67
PCB45	70362-45-7	2.5 – 50	5	20	1.26	6.67
PCB46	41464-47-5	2.5 – 50	10	20	1.41	6.67
PCB47	2437-79-8	2.5 – 50	19	50	3.13	6.67
PCB48/75	70362-47-9/32598-12-2	2.5 – 50	Not provided in method	Not provided in method	2.46	6.67
PCB50	62796-65-0	2.5 – 50	6	20	1.34	6.67
PCB51	68194-04-7	2.5 – 50	5	20	1.18	6.67
PCB52/69	35693-99-3/60233-24-1	2.5 – 50	Not provided in method	Not provided in method	2.33	6.67
PCB53	41464-41-9	2.5 – 50	6	20	1.57	6.67
PCB54	15968-05-5	2.5 – 50	12	50	0.85	6.67
PCB55	74338-24-2	2.5 – 50	12	50	1.41	6.67

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Primary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB56/60	41464-43-1/33025-41-1	2.5 –50	Not provided in method	Not provided in method	1.58	6.67
PCB57	70424-67-8	2.5 – 50	12	50	1.08	6.67
PCB58	41464-49-7	2.5 – 50	13	50	1.24	6.67
PCB61/70	33284-53-6/32598-11-1	2.5 – 50	17	50	1.55	6.67
PCB62	54230-22-7	2.5 – 50	6	20	0.90	6.67
PCB63	74472-34-7	2.5 – 50	14	50	1.73	6.67
PCB65	33284-54-7	2.5 – 50	19	50	1.42	6.67
PCB67	73575-53-8	2.5 – 50	15	50	1.24	6.67
PCB68	73575-52-7	2.5 – 50	15	50	0.94	6.67
PCB73	74338-23-1	2.5 – 50	16	50	1.22	6.67
PCB74	32690-93-0	2.5 – 50	17	50	1.13	6.67
PCB76/66	70362-48-0/32598-10-0	2.5 – 50	Not provided in method	Not provided in method	1.10	6.67
PCB77	32598-13-3	2.5 – 50	17	50	2.42	6.67
PCB78	70362-49-1	2.5 – 50	17	50	0.86	6.67
PCB79	41464-48-6	2.5 – 50	17	50	1.17	6.67
PCB80	33284-52-5	2.5 – 50	18	50	0.79	6.67
PCB81	70362-50-4	2.5 – 50	18	50	1.35	6.67
PCB82	52663-62-4	2.5 – 50	13	50	1.69	6.67
PCB83	60145-20-2	2.5 – 50	22	50	1.36	6.67
PCB84/92	52663-60-2/52663-61-3	2.5 – 50	12	50	1.96	6.67
PCB85/116	65510-45-4/18259-05-7	2.5 – 50	10	20	2.94	6.67
PCB86	55312-69-1	2.5 – 50	15	50	2.88	6.67
PCB87/117/125	38380-02-8/ 68194-11-6/74472-39-2	2.5 – 50	Not provided in method	Not provided in method	3.16	6.67

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Primary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB88/91	55215-17-3/68194-05-8	2.5 – 50	12	50	2.28	6.67
PCB89	73575-57-2	2.5 – 50	19	50	2.12	6.67
PCB90/101	68194-07-0/37680-73-2	2.5 – 50	24	100	1.38	6.67
PCB93	73575-56-1	2.5 – 50	22	50	2.33	6.67
PCB94	73575-55-0	2.5 – 50	12	50	1.13	6.67
PCB95/98/102	38379-99-6/ 60233-25-2/68194-06-9	2.5 – 50	22	50	1.80	6.67
PCB96	73575-54-9	2.5 – 50	21	50	1.11	6.67
PCB97	41464-51-1	2.5 – 50	15	50	1.10	6.67
PCB99	38380-01-7	2.5 – 50	22	50	2.68	6.67
PCB100	39485-83-1	2.5 – 50	22	50	1.08	6.67
PCB103	60145-21-3	2.5 – 50	23	50	1.41	6.67
PCB104	56558-16-8	2.5 – 50	23	50	1.99	6.67
PCB105	32598-14-4	2.5 – 50	11	20	0.68	6.67
PCB106/118	70424-69-0/31508-00-6	2.5 – 50	Not provided in method	Not provided in method	1.51	6.67
PCB107/109	70424-68-9/74472-35-8	2.5 – 50	Not provided in method	Not provided in method	2.34	6.67
PCB108/112	70362-41-3/74472-36-9	2.5 – 50	Not provided in method	Not provided in method	1.82	6.67
PCB110	38380-03-9	2.5 – 50	24	100	1.88	6.67
PCB111/115	39635-32-0/74472-38-1	2.5 – 50	24	100	1.53	6.67
PCB113	68194-10-5	2.5 – 50	24	100	2.33	6.67
PCB114	74472-37-0	2.5 – 50	12	50	0.81	6.67
PCB119	56558-17-9	2.5 – 50	15	50	1.02	6.67
PCB120	68194-12-7	2.5 – 50	15	50	1.07	6.67
PCB121	56558-18-0	2.5 – 50	21	50	1.55	6.67

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Primary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB122	76842-07-4	2.5 – 50	12	50	1.08	6.67
PCB123	65510-44-3	2.5 – 50	15	50	1.19	6.67
PCB124	70424-70-3	2.5 – 50	27	100	1.61	6.67
PCB126	57465-28-8	2.5 – 50	14	50	0.62	6.67
PCB127	39635-33-1	2.5 – 50	28	100	1.00	6.67
PCB128/162	38380-07-3/39635-34-2	2.5 – 50	Not provided in method	Not provided in method	1.58	6.67
PCB129	55215-18-4	2.5 – 50	21	50	1.25	6.67
PCB130	52663-66-8	2.5 – 50	14	50	2.55	6.67
PCB131	61798-70-7	2.5 – 50	12	50	1.14	6.67
PCB132/161	38380-05-1/74472-43-8	2.5 – 50	Not provided in method	Not provided in method	3.91	6.67
PCB133/142	35694-04-3/41411-61-4	2.5 – 50	Not provided in method	Not provided in method	1.78	6.67
PCB134/143	52704-70-8/68194-15-0	2.5 – 50	13	50	1.40	6.67
PCB135	52744-13-5	2.5 – 50	11	50	2.05	6.67
PCB136	38411-22-2	2.5 – 50	9	20	1.28	6.67
PCB137	35694-06-5	2.5 – 50	30	100	1.09	6.67
PCB138/163/164	35065-28-2/ 74472-44-9/74472-45-0	2.5 – 50	Not provided in method	Not provided in method	3.24	6.67
PCB139/149	56030-56-9/38380-04-0	2.5 – 50	Not provided in method	Not provided in method	1.87	6.67
PCB140	59291-64-4	2.5 – 50	20	50	1.76	6.67
PCB141	52712-04-6	2.5 – 50	9	20	1.35	6.67
PCB144	68194-14-9	2.5 – 50	17	50	1.95	6.67
PCB145	74472-40-5	2.5 – 50	32	100	1.65	6.67
PCB146/165	51908-16-8/74472-46-1	2.5 – 50	Not provided in method	Not provided in method	2.10	6.67
PCB147	68194-13-8	2.5 – 50	18	50	1.44	6.67

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Primary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB148	74472-41-6	2.5 – 50	32	100	2.11	6.67
PCB150	68194-08-1	2.5 – 50	33	100	0.92	6.67
PCB151	52663-63-5	2.5 – 50	11	50	1.45	6.67
PCB152	68194-09-2	2.5 – 50	24	100	0.98	6.67
PCB153	35065-27-1	2.5 – 50	13	50	0.82	6.67
PCB154	60145-22-4	2.5 – 50	11	50	2.07	6.67
PCB155	33979-03-2	2.5 – 50	34	100	0.93	6.67
PCB156	38380-08-4	2.5 – 50	13	50	0.85	6.67
PCB157	69782-90-7	2.5 – 50	13	50	1.45	6.67
PCB158/160	74472-42-7/41411-62-5	2.5 – 50	Not provided in method	Not provided in method	2.03	6.67
PCB159	39635-35-3	2.5 – 50	35	100	1.36	6.67
PCB166	41411-63-6	2.5 – 50	12	50	1.32	6.67
PCB167	52663-72-6	2.5 – 50	11	50	0.99	6.67
PCB168	59291-65-5	2.5 – 50	13	50	1.56	6.67
PCB169	32774-16-6	2.5 – 50	16	50	1.17	6.67
PCB170	35065-30-6	2.5 – 50	16	50	1.29	6.67
PCB171	52663-71-5	2.5 – 50	37	100	2.02	6.67
PCB172	52663-74-8	2.5 – 50	38	100	0.97	6.67
PCB173	68194-16-1	2.5 – 50	37	100	1.43	6.67
PCB174	38411-25-5	2.5 – 50	19	50	1.65	6.67
PCB175	40186-70-7	2.5 – 50	38	100	1.27	6.67
PCB176	52663-65-7	2.5 – 50	39	100	1.48	6.67
PCB177	52663-70-4	2.5 – 50	14	50	1.44	6.67
PCB178	52663-67-9	2.5 – 50	22	50	1.32	6.67

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Primary)
Concentration Level: Low-High
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB179	52663-64-6	2.5 – 50	23	50	0.59	6.67
PCB180	35065-29-3	2.5 – 50	14	50	1.75	6.67
PCB181	74472-47-2	2.5 – 50	40	100	1.50	6.67
PCB182/187	60145-23-5/52663-68-0	2.5 – 50	Not provided in method	Not provided in method	1.42	6.67
PCB183	52663-69-1	2.5 – 50	40	100	1.14	6.67
PCB184	74472-48-3	2.5 – 50	40	100	1.41	6.67
PCB185	52712-05-7	2.5 – 50	40	100	1.05	6.67
PCB186	74472-49-4	2.5 – 50	41	100	1.57	6.67
PCB188	74487-85-7	2.5 – 50	23	50	0.79	6.67
PCB189	39635-31-9	2.5 – 50	18	50	1.79	6.67
PCB190	41411-64-7	2.5 – 50	23	50	1.12	6.67
PCB191	74472-50-7	2.5 – 50	42	100	1.36	6.67
PCB192	74472-51-8	2.5 – 50	42	100	1.12	6.67
PCB193	69782-91-8	2.5 – 50	14	50	1.76	6.67
PCB194	35694-08-7	2.5 – 50	17	50	0.74	6.67
PCB195	52663-78-2	2.5 – 50	43	100	0.62	6.67
PCB196/203	42740-50-1/52663-76-0	2.5 – 50	Not provided in method	Not provided in method	1.76	6.67
PCB197	33091-17-7	2.5 – 50	25	100	1.50	6.67
PCB198	68194-17-2	2.5 – 50	20	50	1.88	6.67
PCB199	52663-75-9	2.5 – 50	20	50	2.13	6.67
PCB200	52663-73-7	2.5 – 50	25	100	0.72	6.67
PCB201	40186-71-8	2.5 – 50	44	100	1.51	6.67
PCB202	2136-99-4	2.5 – 50	44	100	1.41	6.67
PCB204	74472-52-9	2.5 – 50	45	100	0.87	6.67

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Primary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB205	74472-53-0	2.5 – 50	45	100	1.18	6.67
PCB206	40186-72-9	2.5 – 50	45	100	1.51	6.67
PCB207	52663-79-3	2.5 – 50	45	100	1.03	6.67
PCB208	52663-77-1	2.5 – 50	46	100	0.94	6.67
PCB209	2051-24-3	2.5 – 50	15	50	1.31	6.67

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Secondary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB1	2051-60-7	12.5 – 250	8	20	3.50	16.7
PCB2	2051-61-8	12.5 – 250	0.4	1	2.16	16.7
PCB3	2051-62-9	25 – 500	9	20	1.35	33.3
PCB4/10	13029-08-8/33146-45-1	25 – 500	Not provided in method	Not provided in method	15.85	33.3
PCB6	25569-80-6	25 – 500	1	5	3.64	33.3
PCB5/8	16605-91-7/34883-43-7	25 – 500	Not provided in method	Not provided in method	8.48	33.3
PCB7/9	33284-50-3/34883-39-1	25 – 500	2	5	3.79	33.3
PCB11	2050-67-1	25 – 500	10	20	54.58	75
PCB12/13	2974-92-7/2974-90-5	25 – 500	3	10	4.99	33.3
PCB14	34883-41-5	25 – 500	3	10	2.35	33.3
PCB15	2050-68-2	12.5 – 250	18	50	4.60	16.7
PCB16/32	38444-78-9/38444-77-8	12.5 – 250	Not provided in method	Not provided in method	6.89	16.7
PCB17	37680-66-3	12.5 – 250	9	20	2.41	16.7
PCB18	37680-65-2	12.5 – 250	17	50	4.99	16.7
PCB19	38444-73-4	12.5 – 250	4	10	1.53	16.7
PCB20/21/33	38444-84-7/ 55702-46-0/38444-86-9	12.5 – 250	Not provided in method	Not provided in method	5.79	16.7
PCB22	38444-85-8	12.5 – 250	9	20	2.91	16.7
PCB23	55720-44-0	12.5 – 250	5	20	1.24	16.7
PCB24/27	55702-45-9/38444-76-7	12.5 – 250	Not provided in method	Not provided in method	1.67	16.7
PCB25	55712-37-3	12.5 – 250	5	20	1.07	16.7
PCB26	38444-81-4	12.5 – 250	8	20	1.05	16.7
PCB28	7012-37-5	12.5 – 250	19	50	6.87	16.7
PCB29	15862-07-4	12.5 – 250	8	20	2.71	16.7

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Secondary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB30	35693-92-6	12.5 – 250	17	50	0.56	16.7
PCB31	16606-02-3	12.5 – 250	15	50	6.04	16.7
PCB34	37680-68-5	12.5 – 250	7	20	2.04	16.7
PCB35	37680-69-6	12.5 – 250	8	20	1.62	16.7
PCB36	38444-87-0	12.5 – 250	8	20	1.40	16.7
PCB37	38444-90-5	12.5 – 250	13	50	3.19	16.7
PCB38	53555-66-1	12.5 – 250	8	20	1.31	16.7
PCB39	38444-88-1	12.5 – 250	9	20	2.42	16.7
PCB40	38444-93-8	12.5 – 250	12	50	3.77	16.7
PCB41/64/71/72	52663-59-9/52663-58-8/ 41464-46-4/41464-42-0	12.5 – 250	Not provided in method	Not provided in method	5.28	16.7
PCB42/59	36559-22-5/74472-33-6	12.5 – 250	6	20	2.34	16.7
PCB43/49	70362-46-8/41464-40-8	12.5 – 250	Not provided in method	Not provided in method	4.19	16.7
PCB44	41464-39-5	12.5 – 250	19	50	5.15	16.7
PCB45	70362-45-7	12.5 – 250	5	20	1.25	16.7
PCB46	41464-47-5	12.5 – 250	10	20	2.06	16.7
PCB47	2437-79-8	12.5 – 250	19	50	7.51	16.7
PCB48/75	70362-47-9/32598-12-2	12.5 – 250	Not provided in method	Not provided in method	2.54	16.7
PCB50	62796-65-0	12.5 – 250	6	20	1.79	16.7
PCB51	68194-04-7	12.5 – 250	5	20	2.13	16.7
PCB52/69	35693-99-3/60233-24-1	12.5 – 250	Not provided in method	Not provided in method	5.55	16.7
PCB53	41464-41-9	12.5 – 250	6	20	1.37	16.7
PCB54	15968-05-5	12.5 – 250	12	50	1.04	16.7
PCB55	74338-24-2	12.5 – 250	12	50	1.48	16.7

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Secondary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB56/60	41464-43-1/33025-41-1	12.5 – 250	Not provided in method	Not provided in method	3.64	16.7
PCB57	70424-67-8	12.5 – 250	12	50	0.79	16.7
PCB58	41464-49-7	12.5 – 250	13	50	1.49	16.7
PCB61/70	33284-53-6/32598-11-1	12.5 – 250	17	50	5.96	16.7
PCB62	54230-22-7	12.5 – 250	6	20	1.87	16.7
PCB63	74472-34-7	12.5 – 250	14	50	1.84	16.7
PCB65	33284-54-7	12.5 – 250	19	50	2.08	16.7
PCB67	73575-53-8	12.5 – 250	15	50	1.02	16.7
PCB68	73575-52-7	12.5 – 250	15	50	1.75	16.7
PCB73	74338-23-1	12.5 – 250	16	50	2.30	16.7
PCB74	32690-93-0	12.5 – 250	17	50	2.92	16.7
PCB76/66	70362-48-0/32598-10-0	12.5 – 250	Not provided in method	Not provided in method	5.55	16.7
PCB77	32598-13-3	12.5 – 250	17	50	3.23	16.7
PCB78	70362-49-1	12.5 – 250	17	50	1.68	16.7
PCB79	41464-48-6	12.5 – 250	17	50	1.39	16.7
PCB80	33284-52-5	12.5 – 250	18	50	0.82	16.7
PCB81	70362-50-4	12.5 – 250	18	50	2.08	16.7
PCB82	52663-62-4	12.5 – 250	13	50	2.49	16.7
PCB83	60145-20-2	12.5 – 250	22	50	1.57	16.7
PCB84/92	52663-60-2/52663-61-3	12.5 – 250	12	50	4.81	16.7
PCB85/116	65510-45-4/18259-05-7	12.5 – 250	10	20	4.31	16.7
PCB86	55312-69-1	12.5 – 250	15	50	4.32	16.7
PCB87/117/125	38380-02-8/ 68194-11-6/74472-39-2	12.5 – 250	Not provided in method	Not provided in method	5.41	16.7

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Secondary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB88/91	55215-17-3/68194-05-8	12.5 – 250	12	50	1.13	16.7
PCB89	73575-57-2	12.5 – 250	19	50	4.16	16.7
PCB90/101	68194-07-0/37680-73-2	12.5 – 250	24	100	9.36	16.7
PCB93	73575-56-1	12.5 – 250	22	50	4.91	16.7
PCB94	73575-55-0	12.5 – 250	12	50	2.19	16.7
PCB95/98/102	38379-99-6/ 60233-25-2/68194-06-9	12.5 – 250	22	50	9.74	16.7
PCB96	73575-54-9	12.5 – 250	21	50	1.45	16.7
PCB97	41464-51-1	12.5 – 250	15	50	2.06	16.7
PCB99	38380-01-7	12.5 – 250	22	50	2.31	16.7
PCB100	39485-83-1	12.5 – 250	22	50	1.92	16.7
PCB103	60145-21-3	12.5 – 250	23	50	2.21	16.7
PCB104	56558-16-8	12.5 – 250	23	50	1.38	16.7
PCB105	32598-14-4	12.5 – 250	11	20	1.16	16.7
PCB106/118	70424-69-0/31508-00-6	12.5 – 250	Not provided in method	Not provided in method	4.10	16.7
PCB107/109	70424-68-9/74472-35-8	12.5 – 250	Not provided in method	Not provided in method	5.01	16.7
PCB108/112	70362-41-3/74472-36-9	12.5 – 250	Not provided in method	Not provided in method	1.53	16.7
PCB110	38380-03-9	12.5 – 250	24	100	5.43	16.7
PCB111/115	39635-32-0/74472-38-1	12.5 – 250	24	100	3.39	16.7
PCB113	68194-10-5	12.5 – 250	24	100	3.60	16.7
PCB114	74472-37-0	12.5 – 250	12	50	1.93	16.7
PCB119	56558-17-9	12.5 – 250	15	50	1.65	16.7
PCB120	68194-12-7	12.5 – 250	15	50	2.81	16.7
PCB121	56558-18-0	12.5 – 250	21	50	1.71	16.7

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Secondary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB122	76842-07-4	12.5 – 250	12	50	1.47	16.7
PCB123	65510-44-3	12.5 – 250	15	50	1.77	16.7
PCB124	70424-70-3	12.5 – 250	27	100	0.79	16.7
PCB126	57465-28-8	12.5 – 250	14	50	1.21	16.7
PCB127	39635-33-1	12.5 – 250	28	100	0.70	16.7
PCB128/162	38380-07-3/39635-34-2	12.5 – 250	Not provided in method	Not provided in method	3.07	16.7
PCB129	55215-18-4	12.5 – 250	21	50	1.04	16.7
PCB130	52663-66-8	12.5 – 250	14	50	3.27	16.7
PCB131	61798-70-7	12.5 – 250	12	50	2.86	16.7
PCB132/161	38380-05-1/74472-43-8	12.5 – 250	Not provided in method	Not provided in method	2.90	16.7
PCB133/142	35694-04-3/41411-61-4	12.5 – 250	Not provided in method	Not provided in method	2.71	16.7
PCB134/143	52704-70-8/68194-15-0	12.5 – 250	13	50	5.19	16.7
PCB135	52744-13-5	12.5 – 250	11	50	3.52	16.7
PCB136	38411-22-2	12.5 – 250	9	20	1.04	16.7
PCB137	35694-06-5	12.5 – 250	30	100	3.44	16.7
PCB138/163/164	35065-28-2/ 74472-44-9/74472-45-0	12.5 – 250	Not provided in method	Not provided in method	4.27	16.7
PCB139/149	56030-56-9/38380-04-0	12.5 – 250	Not provided in method	Not provided in method	5.09	16.7
PCB140	59291-64-4	12.5 – 250	20	50	2.45	16.7
PCB141	52712-04-6	12.5 – 250	9	20	2.69	16.7
PCB144	68194-14-9	12.5 – 250	17	50	3.25	16.7
PCB145	74472-40-5	12.5 – 250	32	100	1.71	16.7
PCB146/165	51908-16-8/74472-46-1	12.5 – 250	Not provided in method	Not provided in method	2.72	16.7
PCB147	68194-13-8	12.5 – 250	18	50	4.12	16.7

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Secondary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB148	74472-41-6	12.5 – 250	32	100	3.57	16.7
PCB150	68194-08-1	12.5 – 250	33	100	1.90	16.7
PCB151	52663-63-5	12.5 – 250	11	50	2.84	16.7
PCB152	68194-09-2	12.5 – 250	24	100	1.23	16.7
PCB153	35065-27-1	12.5 – 250	13	50	4.51	16.7
PCB154	60145-22-4	12.5 – 250	11	50	2.40	16.7
PCB155	33979-03-2	12.5 – 250	34	100	3.08	16.7
PCB156	38380-08-4	12.5 – 250	13	50	1.28	16.7
PCB157	69782-90-7	12.5 – 250	13	50	3.17	16.7
PCB158/160	74472-42-7/41411-62-5	12.5 – 250	Not provided in method	Not provided in method	1.97	16.7
PCB159	39635-35-3	12.5 – 250	35	100	1.85	16.7
PCB166	41411-63-6	12.5 – 250	12	50	3.40	16.7
PCB167	52663-72-6	12.5 – 250	11	50	1.29	16.7
PCB168	59291-65-5	12.5 – 250	13	50	1.21	16.7
PCB169	32774-16-6	12.5 – 250	16	50	3.37	16.7
PCB170	35065-30-6	12.5 – 250	16	50	2.42	16.7
PCB171	52663-71-5	12.5 – 250	37	100	1.68	16.7
PCB172	52663-74-8	12.5 – 250	38	100	2.34	16.7
PCB173	68194-16-1	12.5 – 250	37	100	2.83	16.7
PCB174	38411-25-5	12.5 – 250	19	50	2.24	16.7
PCB175	40186-70-7	12.5 – 250	38	100	2.69	16.7
PCB176	52663-65-7	12.5 – 250	39	100	2.01	16.7
PCB177	52663-70-4	12.5 – 250	14	50	2.70	16.7
PCB178	52663-67-9	12.5 – 250	22	50	1.51	16.7

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Secondary)
Concentration Level: Low-High
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB179	52663-64-6	12.5 – 250	23	50	1.99	16.7
PCB180	35065-29-3	12.5 – 250	14	50	3.67	16.7
PCB181	74472-47-2	12.5 – 250	40	100	2.56	16.7
PCB182/187	60145-23-5/52663-68-0	12.5 – 250	Not provided in method	Not provided in method	4.60	16.7
PCB183	52663-69-1	12.5 – 250	40	100	1.21	16.7
PCB184	74472-48-3	12.5 – 250	40	100	1.67	16.7
PCB185	52712-05-7	12.5 – 250	40	100	2.67	16.7
PCB186	74472-49-4	12.5 – 250	41	100	2.12	16.7
PCB188	74487-85-7	12.5 – 250	23	50	2.61	16.7
PCB189	39635-31-9	12.5 – 250	18	50	1.65	16.7
PCB190	41411-64-7	12.5 – 250	23	50	1.91	16.7
PCB191	74472-50-7	12.5 – 250	42	100	2.23	16.7
PCB192	74472-51-8	12.5 – 250	42	100	3.57	16.7
PCB193	69782-91-8	12.5 – 250	14	50	2.39	16.7
PCB194	35694-08-7	12.5 – 250	17	50	2.50	16.7
PCB195	52663-78-2	12.5 – 250	43	100	1.09	16.7
PCB196/203	42740-50-1/52663-76-0	12.5 – 250	Not provided in method	Not provided in method	8.70	16.7
PCB197	33091-17-7	12.5 – 250	25	100	2.33	16.7
PCB198	68194-17-2	12.5 – 250	20	50	3.19	16.7
PCB199	52663-75-9	12.5 – 250	20	50	3.97	16.7
PCB200	52663-73-7	12.5 – 250	25	100	2.96	16.7
PCB201	40186-71-8	12.5 – 250	44	100	2.25	16.7
PCB202	2136-99-4	12.5 – 250	44	100	1.08	16.7
PCB204	74472-52-9	12.5 – 250	45	100	3.09	16.7

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: PCB Congeners (Secondary)
Concentration Level: Low
Analytical Method/SOP Reference: L-9, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] ng/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs ng/kg	Method QLs ng/kg	MDLs ng/kg	QLs[d] ng/kg
PCB205	74472-53-0	12.5 – 250	45	100	1.28	16.7
PCB206	40186-72-9	12.5 – 250	45	100	2.09	16.7
PCB207	52663-79-3	12.5 – 250	45	100	1.17	16.7
PCB208	52663-77-1	12.5 – 250	46	100	1.51	16.7
PCB209	2051-24-3	12.5 – 250	15	50	1.96	16.7

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: Chlorinated Herbicides
Concentration Level: Low
Analytical Method/SOP Reference: L-10, L-23, and L-24

Analyte	CAS Number	Project Quantitation Limit[c] µg/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs µg/kg	Method QLs µg/kg	MDLs µg/kg	QLs[d] µg/kg
2,4-D	94-75-7	30000 - 600000	0.11	Not provided in method	8900	80000
2,4-DB	94-82-6	23000 - 450000	Not provided in method	Not provided in method	6200	60000
2,4,5-TP(Silvex)	93-72-6	13000 - 250000	0.28	Not provided in method	540	33000
2,4,5-T	93-76-5	13000 - 250000	Not provided in method	Not provided in method	1900	33000

See the last page of Worksheet #15-3 for footnotes.

QAPP Worksheet #15-3
Reference Limits and Evaluation – LSM Particulate (Continued)

Matrix: LSM Particulate
Analytical Group: Miscellaneous
Concentration Level: Low
Analytical Method/SOP Reference: L-11/L-22

Analyte	CAS Number	Project Quantitation Limit[c] mg/kg	Analytical Method[a]		Achievable Laboratory Limits[b]	
			MDLs mg/kg	Method QLs mg/kg	MDLs mg/kg	QLs[d] mg/kg
POC	NA	3100 - 630000	Not provided in method	Not provided in method	2690	8300

Notes:

[a] Analytical MDLs and QLs are those documented in validated methods.
[b] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.
[c] Project quantitation limit is based on the concentration of projected TSS range.
[d] Quantitation limit based on average TSS (150 mg/L).

CAS = Chemical Abstracts Service
LSM = low-solids mass
MDL = method detection limit
mg/kg = milligrams per kilogram
mg/L = milligrams per liter
NA = not applicable
ng/kg = nanograms per kilogram
PCBs= polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/ polychlorinated dibenzofurans
POC = particulate organic carbon
QL = quantitation limit
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TBD = to be determined
TSS = total suspended solids
µg/kg = micrograms per kilogram

QAPP Worksheet #15-4
Reference Limits and Evaluation – Grab Sample

Matrix: Field/Rinse/Equipment Blank, Grab Sample Whole Water, and Grab Sample Dissolved
Analytical Group: Metals
Concentration Level: Low
Analytical Method/SOP Reference: L-4, L-5 and L-6

Analyte	CAS Number	Project Quantitation Limit µg/L	Analytical Method [a]		Achievable Laboratory Limits [b]	
			MDLs µg/L	Method QLs µg/L	MDLs µg/L	QLs µg/L
Aluminum	7429-90-5	4	Not provided in method	Not provided in method	0.13	4
Antimony	7440-36-0	0.02	0.0097	0.02	0.005	0.02
Arsenic	7440-38-2	0.15	Not provided in method	Not provided in method	0.03	0.15
Barium	7440-39-3	0.2	Not provided in method	Not provided in method	0.010	0.2
Beryllium	7440-41-7	0.06	Not provided in method	Not provided in method	0.012	0.06
Cadmium	7440-43-9	0.02	0.025	0.1	0.006	0.02
Calcium	7440-70-2	40	Not provided in method	Not provided in method	6.0	40
Chromium	7440-47-3	0.15	Not provided in method	Not provided in method	0.07	0.15
Cobalt	7440-48-4	0.1	Not provided in method	Not provided in method	0.020	0.1
Copper	7440-50-8	0.1	0.087	0.2	0.040	0.1
Iron	7439-89-6	10	Not provided in method	Not provided in method	1.4	10
Lead	7439-92-1	0.05	0.015	0.05	0.015	0.05
Magnesium	7439-95-4	3	Not provided in method	Not provided in method	0.60	3
Manganese	7439-96-5	0.1	Not provided in method	Not provided in method	0.010	0.1
Nickel	7440-02-0	0.1	0.33	1	0.03	0.1
Potassium	7440-09-7	40	Not provided in method	Not provided in method	2.0	40
Selenium	7782-49-2	0.6	0.45	1	0.11	0.6
Silver	7440-22-4	0.02	0.029	0.1	0.005	0.02
Sodium	7440-23-5	20	Not provided in method	Not provided in method	2.1	20
Titanium	7440-32-6	0.5	Not provided in method	Not provided in method	0.04	0.5
Thallium	7440-28-0	0.01	0.0079	0.02	0.002	0.01
Vanadium	7440-62-2	0.15	Not provided in method	Not provided in method	0.03	0.15
Zinc	7440-66-6	0.2	0.14	0.5	0.06	0.2
Mercury	7439-97-6	0.5 ng/L	0.2 ng/L	0.5 ng/L	0.15 ng/L	0.5 ng/L
Methyl mercury	22967-92-6	0.05 ng/L	0.02 ng/L	0.06 ng/L	0.010 ng/L	0.05 ng/L

See the last page of Worksheet #15-4 for footnotes.

QAPP Worksheet #15-4
Reference Limits and Evaluation – Grab Sample (Continued)

Notes:

[a] Analytical MDLs and QLs are those documented in validated methods .
[b] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method

CAS = Chemical Abstracts Service
MDL = method detection limit
ng/L = nanograms per liter
QL = quantitation limit
SOP = Standard Operating Procedure
TBD = to be determined
µg/L = micrograms per liter

QAPP Worksheet #16
Project Schedule/Timeline[a]

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
QAPP Preparation	Environmental Data Services, Ltd. and ARCADIS U.S., Inc	02/01/10	05/27/11	CSO/SWO Investigation QAPP[b]	05/27/11
USEPA Review and Approval of QAPP	USEPA	07/14/10	06/17/11	CSO/SWO Investigation QAPP approval letter	06/17/11
Analytical Method and Data Validation SOPs Preparation	Environmental Data Services, Ltd.	03/08/10	03/17/11	QAPP Appendices B and C, CSO/SWO Investigation Analytical Methods and Data Validation SOPs	03/17/11
USEPA Review and Approval of Analytical Method and Data Validation SOPs	USEPA	03/18/11	03/31/11	CSO/SWO Investigation QAPP Appendices B and C approval letter	04/01/11
MDL Studies	Environmental Data Services, Ltd.; TestAmerica, Burlington, VT; Vista Analytical; Brooks Rand Labs	10/25/11	02/22/12	MDLs provided by laboratories	02/22/12
Evaluation of laboratory MDL study results and completion of CSO/SWO Investigation QAPP Worksheets #15-1 through 15-4	Environmental Data Services, Ltd.	02/22/12	04/20/12	CSO/SWO Investigation QAPP Addendum containing completed Worksheets #15-1 through 15-4	04/20/12
USEPA Review and Approval of CSO/SWO Investigation QAPP Addendum containing completed Worksheets #15-1 through 15-4	USEPA	04/20/12	05/21/12	CSO/SWO Investigation QAPP Addendum containing completed Worksheets #15-1 through 15-4 approval letter	05/21/12
Phase I Mobilization	ARCADIS U.S., Inc.	05/21/12	07/09/12	None	NA
Field Readiness Review	ARCADIS U.S., Inc. and Environmental Data Services, Ltd.	07/06/12	07/06/12	Participant Sign-Off Sheet	07/06/12
Laboratory Readiness Review	Environmental Data Services, Ltd.	07/06/12	07/06/12	Participant Sign-Off Sheet	07/06/12
Phase I Sampling	ARCADIS U.S., Inc.	07/10/12	07/30/12	All samples submitted to laboratory	07/30/12
Phase I Laboratory Analysis	TestAmerica, Burlington, VT; Vista Analytical; Brooks Rand Labs	07/11/12	09/17/12	Data packages	09/17/12
Phase I Data Verification/Validation	Environmental Data Services, Ltd.	09/17/12	10/29/12	Data Verification/Validation Reports	10/29/12
Phase I Data Evaluation	ARCADIS U.S., Inc.	10/29/12	12/10/12	Recommendation Report	12/10/12

See the last page of Worksheet #16 for a description of footnotes.

QAPP Worksheet #16
Project Schedule/Timeline[a] (Continued)

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
USEPA Review and Approval of Data Evaluation and Recommendation Report	USEPA	12/11/12	01/23/13	Recommendation Report approval letter	01/23/13
Prepare Phase II QAPP Addendum	Environmental Data Services, Ltd.	01/24/13	03/21/13	CSO/SW O Phase II QAPP Addendum	03/21/13
USEPA Review and Approval of Phase II QAPP Addendum	USEPA	03/22/13	05/01/13	CSO/SWO Phase II QAPP Approval Letter	05/01/13
Phase II Mobilization	ARCADIS U.S., Inc.	05/02/13	06/14/13	None	NA
Field Readiness Review	ARCADI S U.S., Inc.	06/14/13	06/14/13	Participant Sign-Off Sheet	06/14/13
Laboratory Readiness Review	Environmental Data Services, Ltd.	06/14/13	06/14/13	Participant Sign-Off Sheet	06/14/13
Phase II Sampling	ARCADIS U.S., Inc.	06/17/13	06/24/14	All samples subm itted to laboratory	06/24/14
Phase II Laboratory Analysis	TBD	06/18/13	08/10/14	Data packages	08/10/14
Phase II Data Verification/Validation Report	Environmental Data Services, Ltd.	08/10/14	10/09/14	Data Verification/Validation Reports	10/09/14
Compilation of USEPA , Region 2 Compliant MEDD	Environmental Data Services, Ltd.	08/10/14	02/10/15	USEPA Region 2 Compliant MEDD	02/10/15
Data Usability Assessment	Environmental Data Services, Ltd.	10/09/14	02/09/15	Data Quality and Usability Assessment Report	02/09/15
USEPA Review and Approval of Data Quality and Usability Assessment Report	USEPA	02/09/15	03/17/15	Data Quality and Usability Assessment Report Approval Letter	03/17/15

Notes:

[a] The Project Schedule is dependent on review/revision/approval periods for this CSO/SWO Investigation QAPP and the Recommendation Report. The Project Schedule is also dependent on factors, such as weather conditions and appropriate overflow events occurring during sampling periods.
[b] CSO/SWO Investigation QAPP deliverable to consist of completed Worksheets #1 through #37 (with the exception of MDL values in Worksheets #15-1 through 15-4 listed as TBD), as well as appendices containing field/sample collection SOPs.

CSO = combined sewer overflow
MDL = method detection limit
NA = not applicable
QAPP = Quality Assurance Project Plan
SOP = Standard Operating Procedure
SW O = stormwater outfall
TBD = to be determined
USEPA = U.S. Environmental Protection Agency

QAPP Worksheet #19-1
Analytical SOP Requirements – Water[a]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[b]	Sample Volume (mL)[c]	Containers (number and type)[d]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)[e,f]
Water	Semivolatile Organics[g]	Low	L-1, L-17, L-24	2500	2.5 L, G	4°C	7 days to extraction, 40 days until analysis
Water	Volatile Organics[h]	Low	L-1	40	40 mL vial, G	4°C, HCl to pH <2	14 days
Water	Aroclor PCBs	Low	L-1, L-24, L-25	1000	1 L, G	4°C	7 days to extraction, 40 days until analysis
Water	Organochlorine Pesticides[g]	Low	L-2, L-19, L-24	2500	2.5 L, G	4°C	7 days to extraction, 40 days until analysis
Water	Semivolatile Organics (SIM)[g]	Low	L-1, L-18, L-24	2500	2.5 L, G	4°C	7 days to extraction, 40 days until analysis
Water	Metals[i,j]	Low	L-4	250	250 mL, fluoropolymer	4°C, HNO_3 to pH <2	14 days to preservation, 6 months until analysis
Water	Mercury[i,j]	Low	L-5	500	500 mL, fluoropolymer	4°C, BrCl to pH <2	24 hours to preservation, 28 days until analysis
Water	Methylmercury[i,j]	Low	L-6	250	250 mL, fluoropolymer	4°C, HCl to pH <2	48 hours to preservation, 28 days until analysis
Water	Cyanide	Low	L-7	250	250 mL, P	NaOH to pH >12	14 days
Water	PCDD/PCDFs[g]	Low	L-8, L-20, L-24	10000	4x (2.5 L), G	4°C	30 days to extraction, 45 days until analysis
Water	PCB Congeners[g]	Low	L-9, L-21, L-24	5000	2x (2.5 L), G	4°C	30 days to extraction, 40 days until analysis
Water	Chlorinated Herbicides[g]	Low	L-10, L-24, L-25	1000	1 L, G	4°C	7 days to extraction, 40 days until analysis
Water	TOC	Low	L-12	250	250 mL, G	4°C, H_2SO_4 to pH <2	14 days
Water	TEPH	Low	L-13	1000	1 L, G	4°C, HCl to pH <2	14 days to extraction, 40 days until analysis
Water	Grain Size	Low	L-14	1000	1 L, G	4°C	60 days
Water	TSS	Low	L-15	1500	1000 mL/ 500 mL, P	4°C	7 days
Water	TDS	Low	L-16				7 days

See the last page of Worksheet #19-1 for a description of footnotes .

QAPP Worksheet #19-1
Analytical SOP Requirements – Water[a]

Notes:

[a] Water matrices include HSM dissolved, whole water, LSM dissolved, grab sample whole water, grab sample dissolved , and field/ rinsate/ equipment blanks.
[b] Analytical methods are as specified in Worksheet #23-1.
[c] These are minimum sample volume requirements for a single sample analysis. Extra volume will be needed in order to fulfill quality control sample requirements, such as matrix spike/matrix spike duplicate and/or to provide contingency volume for analysis or breakage.
[d] Samples for analyses having identical container and preservation requirements may be combined in the same container. Similarly, smaller - or larger -sized sample containers than those recommended here may be used as long as the quality, container material, and preservative specifications are met, and the containers or c ontainer used will hold sufficient mass/volume to meet the minimum requirements specified.
[e] Holding time is calculated from the date and time of sample collection, to the date and time of sample analysis (or extraction as noted).
[f] Maximum holding times listed are based upon those stipulated in corresponding data validation guidance located in Appendix C of this CSO/SWO Investigation Quality Assurance Project Plan.
[g] All water samples will be field tested for the presence of residual chlorine using appropriate test strips. If residual chlorine is determined to be present in a given sample, the sample will be further preserved by the addition of sodium thiosulfate to a concentration of 0.008 percent. See SOP-8 for details.
[h] Volatile organics are analyzed at the trace level in water matrices.
[i] Specifications apply to both total and dissolved analyses (post-separation).
[j] Samples will be shipped at 4°C to the laboratory via overnight carrier on the same day they are collected. Preservation will occur at the laboratory within the specified holding time (immediately upon receipt) in order to minimize the sources of potential field contamination. Sample will be stored for a minimum of 48 hours at 4°C after preservation and prior to analysis to allow the acid to completely dissolve the metals adsorbed on the container walls.

°C = degrees Celsius
BrCl = bromine chloride
CSO = combined sewer overflow
G = amber glass
P = plastic
H_2SO_4 = sulfuric acid
HCl = hydrochloric acid
HNO_3 = nitric acid
HSM = high-solids mass
L = liter
LSM = low-solids mass
mL = milliliters
NaOH = sodium hydroxide
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/ polychlorinated dibenzofurans
SIM = selective ion monitoring
SOP = Standard Operating Procedure
SWO = stormwater outfall
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
TSS = total suspended solids

QAPP Worksheet #19-2
Analytical SOP Requirements – HSM Particulate

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [a]	Sample Mass (g) [b]	Containers (number and type) [c]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis) [d,e]
HSM Particulate	Volatile Organics [f]	Low	L-1	15	3x (5 g) Encore™ Sampler, or equivalent	4°C	48 hours to extraction, 12 days until analysis
HSM Particulate	Semivolatile Organics	Low	L-1	30	4 (16 oz) G [g,h]	4°C	7 days to extraction, 40 days until analysis
HSM Particulate	Aroclor PCBs	Low	L-1	30			7 days to extraction, 40 days until analysis
HSM Particulate	Chlorinated Herbicides	Low	L-10	50			14 days to extraction, 40 days until analysis
HSM Particulate	TOC	Low	L-11	10			14 days
HSM Particulate	TEPH	Low	L-13	30			14 days to extraction, 40 days until analysis
HSM Particulate	Semivolatile Organics (SIM)	Low	L-1	30			7 days to extraction, 40 days until analysis
HSM Particulate	Cyanide	Low	L-7	5			14 days
HSM Particulate	Organochlorine Pesticides	Low	L-2, L-26	10	8.8 oz, G	4°C	7 days to extraction, 40 days until analysis
HSM Particulate	PCDD/PCDFs	Low	L-8	10	8.8 oz, G [i]	4°C	30 days to extraction, 45 days until analysis
HSM Particulate	PCB Congeners	Low	L-9	10			30 days to extraction, 40 days until analysis

Notes:
[a] Analytical methods are as specified in Worksheet #23.
[b] These are minimum sample mass requirements for a single sample analysis. Extra mass/volume will be needed in order to fulfill quality control sample requirements, such as matrix spike/matrix spike duplicate and/or to provide contingency mass/volume for re-analysis or breakage.
[c] Samples for analyses having identical container and preservation requirements may be combined in the same container. Similarly, smaller- or larger-sized sample containers than those recommended here may be used as long as the quality, container material, and preservative specifications are met, and the containers or container used will hold sufficient mass/volume to meet the minimum requirements specified.
[d] Holding time is calculated from the date and time of sample collection, to the date and time of sample analysis (or extraction as noted).
[e] Maximum holding times listed are based upon those stipulated in corresponding data validation guidance located in Appendix C of this Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan.
[f] A separate Percent Moisture sample must be collected with the VOCs per USEPA Contract Laboratory Program SOM01.2. If insufficient solids are collected to use Encore™ samplers directly, the sampling crew will use a stainless steel spoon or spatula to fill the Encore™ samples in accordance with SOP-4.
[g] Short, wide-mouth jars with Teflon®-lined lids.
[h] Semivolatile organics, Aroclor PCB, organochlorine pesticides, chlorinated herbicides, TOC, and TEPH can all be combined in the same (three) 16-oz containers.
[i] PCDD/PCDFs and Congener PCBs can both be combined in the same 8.8-oz container.

°C = degrees Celsius
G = amber glass
g = gram
HSM = high-solids mass
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
oz = ounce
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
VOCs = volatile organic compounds
USEPA = U.S. Environmental Protection Agency

QAPP Worksheet #19-3
Analytical SOP Requirements – LSM Particulate [a]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [b]	Sample Mass (g) [c]	Containers (number and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis) [d,e]
LSM Particulate	Semivolatile Organics	Low	L-1, L-23, L-24	0.375	250 mL wide mouth amber glass jar	4°C	7 days to extraction, 40 days until analysis
LSM Particulate	Aroclor PCBs	Low	L-1, L-23, L-24	0.15	250 mL wide mouth amber glass jar	4°C	7 days to extraction, 40 days until analysis
LSM Particulate	Organochlorine Pesticides	Low	L-2, L-23, L-24	0.375	250 mL wide mouth amber glass jar	4°C	7 days to extraction, 40 days until analysis
LSM Particulate	Semivolatile Organics (SIM)	Low	L-1, L-23, L-24	0.375	250 mL wide mouth amber glass jar	TBD	7 days to extraction, 40 days until analysis
LSM Particulate	PCDD/PCDFs	Low	L-8, L-23, L-24	1.5	500 mL wide mouth amber glass jar	4°C	30 days to extraction, 45 days until analysis
LSM Particulate	PCB Congeners	Low	L-9, L-23, L-24	0.75	500 mL wide mouth amber glass jar	4°C	30 days to extraction, 40 days until analysis
LSM Particulate	Chlorinated Herbicides	Low	L-10, L-23, L-24	0.15	250 mL wide mouth amber glass jar	4°C	7 days to extraction, 40 days until analysis
LSM Particulate	POC	Low	L-11, L-22	0.6	NA [f]	4°C	14 days

Notes:
[a] The LSM particulate phase includes solids collected on the 0.7 micrometer flat fiber filter, and if the secondary filtration approach is utilized, those collected in the 0.5 micrometer cartridge filter as well.
[b] Analytical methods are as specified in Worksheet #23.
[c] Sample mass based on expected average LSM particulate mass. These are minimum sample mass requirements for a single sample analysis. Extra mass will be needed in order to fulfill quality control sample requirements, such as matrix spike/matrix spike duplicate and/or to provide contingency mass for re-analysis or breakage.
[d] Holding time is calculated from the date and time of sample collection, to the date and time of sample analysis (or extraction as noted). Sample collection date for LSM particulate and LSM dissolved samples is equivalent to date of LSM bulk sample separation.
[e] Maximum holding times listed are based upon those stipulated in corresponding data validation guidance located in Appendix C of this Combined Sewer Overflow/Stormwater Outfall Investigation Quality Assurance Project Plan.
[f] Sample will not be stored in a container, it will be analyzed immediately after filtration.

°C = degrees Celsius
g = gram
LSM = low-solids mass
NA = not applicable
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
POC = particulate organic carbon
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TBD = to be determined

QAPP Worksheet #20-1a
Whole Water Field Quality Control Sample Summary (Phase I)[a]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [b]	Number of Samples Collected	Number of Field Duplicate Pairs	Number of MS[b]	Number of MSD or Duplicates [c]	Number of Trip Blanks	Number of Field Blanks[d]	Total Number of Samples to Lab[e]
Whole Water	Semivolatile Organics	Low	L-1, L-17	2	1	1	1	NA	1	5
Whole Water	Volatile Organics	Low	L-1	2	1	1	1	2	1	7
Whole Water	Aroclor PCBs	Low	L-1, L-25	2	1	1	1	NA	1	5
Whole Water	Organochlorine Pesticides	Low	L-2, L-19	2	1	1	1	NA	1	5
Whole Water	Semivolatile Organics (SIM)	Low	L-1, L-18	2	1	1	1	NA	1	5
Whole Water	Metals	Low	L-4	2	1	1	1	2	1	10
Whole Water	Mercury	Low	L-5	2	1	1	1	2	1	10
Whole Water	Methyl mercury	Low	L-6	2	1	1	1	2	1	10
Whole Water	Cyanide	Low	L-7	2	1	1	1	NA	1	5
Whole Water	PCDD/PCDFs	Low	L-8, L-20	2	1	1	1	NA	1	5
Whole Water	PCB Congeners	Low	L-9, L-21	2	1	1	1	NA	1	5
Whole Water	Chlorinated Herbicides	Low	L-10, L-25	2	1	1	1	NA	1	5
Whole Water	TOC	Low	L-12	2	1	1	1	NA	1	5
Whole Water	TEPH	Low	L-13	2	1	1	1	NA	1	5
Whole Water	Grain Size	Low	L-14	2	1	NA	1	NA	1	4
Whole Water	TSS	Low	L-15	2	1	NA	1	NA	1	4
Whole Water	TDS	Low	L-16	2	1	NA	1	NA	1	4

Notes:
[a] Laboratory performance evaluation (PE) samples are part of the planned project quality control program. However, those samples are not listed here, as these quality control samples will be administered separately from the field sample collection tasks.
[b] Referenced from the Analytical SOP References Table (Worksheet #23).
[c] Assumes MS/MSD will be collected at a rate of one (MS) and one (MSD) per up to 20 samples or per SDG (whichever is more frequent) for all constituents except cyanide, which will have one MS and one laboratory duplicate per up to 20 samples or per SDG (whichever is more frequent), and grain size, TSS, and TDS, which will have 1 laboratory duplicate per up to 20 samples collected or per SDG (whichever is more frequent).
[d] Field blank numbers listed are those that are associated with a given sample. However, because field blanks are shared between various sample collection techniques in Phase I, this value may not represent the actual number of field blanks collected or sent to the laboratories.
[e] This value excludes field blanks. Also, in the case of metals, mercury, and methylmercury, the total number of samples listed accounts for both total and dissolved samples to be collected.

MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/ dibenzofurans
SDG = sample delivery group
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
TSS = total suspended solids

QAPP Worksheet #20-1b
HSM Particulate Field Quality Control Sample Summary (Phase I)[a]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [b]	Number of Samples Collected	Number of Field Duplica te Pairs	Number of MS[c]	Number of MSD or Duplicates[c]	Number of Trip Blanks	Number of Rinse/ Field Blanks[d]	Total Number of Samples to Lab[e]
HSM Particulate	Semivolatile Organics	Low	L-1	2	1	1	1	NA	2	5
HSM Particulate	Volatile Organics	Low	L-1	2	1	1	1	2	2	7
HSM-Particulate	Aroclor PCBs	Low	L-1	2	1	1	1	NA	2	5
HSM Particulate	Organochlorine Pesticides	Low	L-2, L-26	2	1	1	1	NA	2	5
HSM Particulate	Semivolatile Organics (SIM)	Low	L-1	2	1	1	1	NA	2	5
HSM Particulate	Cyanide	Low	L-7	2	1	1	1	NA	2	5
HSM Particula te	PCDD/PCDFs	Low	L-8	2	1	1	1	NA	2	5
HSM Particulate	PCB Congeners	Low	L-9	2	1	1	1	NA	2	5
HSM Particulate	Chlorinated Herbicides	Low	L-10	2	1	1	1	NA	2	5
HSM Particulate	TOC	Low	L-11	2	1	1	1	NA	2	5
HSM Particulate	TEPH	Low	L-13	2	1	1	1	NA	2	5

Notes:

[a] Laboratory performance evaluation (PE) samples are part of the planned project quality control program. However, those samples are not listed here, as these quality control samples will be administered separately from the field sample collection control tasks.
[b] Referenced from the Analytical SOP References Table (Worksheet #23).
[c] Assumes MS/MSD will be collected at a rate of one (MS) and one (MSD) per up to 20 samples or per SDG (whichever is more frequent) for all constituents , except cyanide, which will have one MS and laboratory duplicate per up to 20 samples collected or per SDG, whichever is more frequent .
[d] Field blanks will be applied to both HSM particulate and dissolved- phases. Field blank numbers listed are those that are associated with a given sample. However, because field blanks are shared between various sample collection techniques in Phase I, this value may not represent the actual number of field blanks collected or sent to the lab oratories .
[e] This value excludes rinse/ field blanks.

HSM = high-solids mass
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
SDG = sample delivery group
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon

QAPP Worksheet #20-1c
HSM Dissolved Field Quality Control Sample Summary (Phase I)[a]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [b]	Number of Samples Collected	Number of Field Duplicate Pairs	Number of MS[c]	Number of MSD or Duplicates[c]	Number of Trip Blanks	Number of Field Blanks[d]	Total Number of Samples to Lab[e]
HSM Dissolved	Semivolatile Organics	Low	L-1, L-17	2	1	1	1	NA	2	5
HSM Dissolved	Volatile Organics	Low	L-1	2	1	1	1	2	2	7
HSM Dissolved	Aroclor PCBs	Low	L-1, L-25	2	1	1	1	NA	2	5
HSM Dissolved	Organochlorine Pesticides	Low	L-2, L-19	2	1	1	1	NA	2	5
HSM Dissolved	Semivolatile Organics (SIM)	Low	L-1, L-18	2	1	1	1	NA	2	5
HSM Dissolved	Cyanide	Low	L-7	2	1	1	1	NA	2	5
HSM Dissolved	PCDD/PCDFs	Low	L-8, L-20	2	1	1	1	NA	2	5
HSM Dissolved	PCB Congeners	Low	L-9, L-21	2	1	1	1	NA	2	5
HSM Dissolved	Chlorinated Herbicides	Low	L-10, L-25	2	1	1	1	NA	2	5
HSM Dissolv ed	DOC	Low	L-12	2	1	1	1	NA	2	5
HSM Dissolved	TEPH	Low	L-13	2	1	1	1	NA	2	5
HSM Dissolved	TSS	Low	L-15	2	1	NA	1	NA	2	4
HSM Dissolved	TDS	Low	L-16	2	1	NA	1	NA	2	4

Notes:

[a] Laboratory performance evaluation (PE) samples are part of the planned project quality control program. However, those samples are not listed here, as these quality control samples will be administered separately from the field sample collection control tasks.
[b] Referenced from the Analytical SOP References Table (Worksheet #23).
[c] Assumes MS/MSD will be collected at a rate of one (MS) and one (MSD) per up to 20 samples or per SDG (whichever is more frequent) for all constituents , except cyanide, which will have one MS and one laboratory duplicate per up to 20 samples collected or per SDG (whichever is more frequent), and TSS and TDS, which will have one laboratory duplicate per up to 20 samples collected.
[d] Field blanks will be applied to both HSM particulate and dissolved- phases. Field blank numbers listed are those that are associated with a given sample. However, because field blanks are shared between various sample collection techniques in Phase I, this value may not represent the actual number of field blanks collected or sent to the laboratories .
[e] This value excludes field blanks.

DOC = dissolved organic carbon
HSM = high-solids mass
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
SDG = sample delivery group
SIM = selective ion monitoring
SOP = standard operating procedure
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TSS = total suspended solids

QAPP Worksheet #20-1d
LSM Particulate Field Quality Control Sample Summary (Phase I)[a]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [b]	Number of Samples Collected	Number of Field Duplicate Pairs	Number of MS [c]	Number of MSD or Duplicates [c]	Number of Trip Blanks	Number of Field/ Equipment Blanks [d]	Total Number of Samples to Lab [e]
LSM Particulate	Semivolatile Organics	Low	L-1, L-23, L-24	2	1	1	1	NA	2	5
LSM Particulate	Aroclor PCBs	Low	L-1, L-23, L-24	2	1	1	1	NA	2	5
LSM Particulate	Organochlorine Pesticides	Low	L-2, L-23, L-24	2	1	1	1	NA	2	5
LSM Particulate	Semivolatile Organics (SIM)	Low	L-1, L-23, L-24	2	1	1	1	NA	2	5
LSM Particulate	PCDD/PCDFs	Low	L-8, L-23, L-24	2	1	1	1	NA	2	5
LSM Particulate	PCB Congeners	Low	L-9, L-23, L-24	2	1	1	1	NA	2	5
LSM Particulate	Chlorinated Herbicides	Low	L-10, L-23, L-24	2	1	1	1	NA	2	5
LSM Particulate	POC	Low	L-11, L-22	2	1	1	1	NA	2	5

Notes:

[a] Laboratory performance evaluation (PE) samples are part of the planned project quality control program. However, those samples are not listed here, as these quality control samples will be administered separately from the field sample collection control tasks.
[b] Referenced from the Analytical SOP References Table (Worksheet #23).
[c] Assumes MS/MSD will be collected at a rate of one (MS) and one (MSD) per up to 20 samples or per SDG (whichever is more frequent) for all constituents.
[d] Field/equipment blanks will be applied to both LSM particulate and dissolved-phases. Field/equipment blank numbers listed are those that are associated with a given sample. However, because field/equipment blanks are shared between various sample collection techniques in Phase I, this value may not represent the actual number of field/equipment blanks collected or sent to the laboratories.
[e] This value excludes field/equipment blanks.

LSM = low-solids mass
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/dibenzofurans
POC = particulate organic carbon
SDG = sample delivery group
SIM = selective ion monitoring
SOP = Standard Operating Procedure

QAPP Worksheet #20-1e
LSM Dissolved Field Quality Control Sample Summary (Phase I)[a]

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [b]	Number of Samples Collected	Number of Field Duplicate Pairs	Number of MS [c]	Number of MSD or Duplicates [c]	Number of Trip Blanks	Number of Field/ Equipment Blanks [d]	Total Number of Samples to Lab [e]
LSM Dissolved	Semivolatile Organics	Low	L-1, L-17, L-24	2	1	1	1	NA	2	5
LSM Dissolved	Aroclor PCBs	Low	L-1, L-24, L-25	2	1	1	1	NA	2	5
LSM Dissolved	Organochlorine Pesticides	Low	L-2, L-19, L-24	2	1	1	1	NA	2	5
LSM Dissolved	Semivolatile Organics (SIM)	Low	L-1, L-18, L-24	2	1	1	1	NA	2	5
LSM Dissolved	PCDD/PCDFs	Low	L-8, L-20, L-24	2	1	1	1	NA	2	5
LSM Dissolved	PCB Congeners	Low	L-9, L-21, L-24	2	1	1	1	NA	2	5
LSM Dissolved	Chlorinated Herbicides	Low	L-10, L-24, L-25	2	1	1	1	NA	2	5
LSM Dissolved	DOC	Low	L-12, L-22	2	1	1	1	NA	2	5
LSM Dissolved	TSS	Low	L-15	2	1	NA	1	NA	2	4
LSM Dissolved	TDS	Low	L-16	2	1	NA	1	NA	2	4

Notes:

[a] Laboratory performance evaluation (PE) samples are part of the planned project quality control program. However, those samples are not listed here, as these quality control samples will be administered separately from the field sample collection control tasks.
[b] Referenced from the Analytical SOP References Table (Worksheet #23).
[c] Assumes MS/MSD will be collected at a rate of one (MS) and one (MSD) per up to 20 samples or per SDG (whichever is more frequent) for all constituents, except TSS and TDS, which will have one laboratory duplicate per up to 20 samples collected or per SDG (whichever is more frequent).
[d] Field/equipment blanks will be applied to both LSM particulate and dissolved -phases. Field/equipment blank numbers listed are those that are associated with a given sample. However, because field/equipment blanks are shared between various sample collection techniques in Phase I, this value may not represent the actual number of field/equipment blanks collected or sent to the laboratories.
[e] This value excludes field/equipment blanks.

DOC = dissolved organic carbon
LSM = low-solids mass
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/dibenzofurans
SDG = sample delivery group
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TDS = total dissolved solids
TSS = total suspended solids

QAPP Worksheet #23-1
Analytical Method/SOP References

Reference Numbe r	Analytical Method/SOP	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-1	USEPA CLP, SOM01.2	Definitive	Semivolatile Organics	GC/MS	Test America, Burlington , VT	Y
L-1	USEPA CLP, SOM01.2	Definitive	Volatile Organics[a]	GC/MS	TestAmerica , Burlington , VT	N
L-1	USEPA CLP, SOM01.2	Definitive	Aroclor PCBs	GC/ECD	TestAmerica , Burlington , VT	Y
L-1	USEPA CLP, SOM01.2	Definitive	Semivolatile Organics (SIM)	GC/MS/SIM	TestAmerica, Burlington, VT	Y
L-2	USEPA 1699	Definitive	Organochlorine Pesticides	HRGC/ HRMS	Vista Analytical	Y
L-3	Intentionally left blank					
L-4	USEPA 1638	Definitive	Metals	ICP/MS	Brooks Rand Labs, Seattle, WA	Y
L-5	USEPA 1631	Definitive	Mercury	CVAFS	Brooks Rand Labs, Seattle, WA	N
L-6	USEPA 1630	Definitive	Methylmercury	CVAFS	Brooks Rand Labs, Seattle, WA	N
L-7	USEPA CLP, ISM01.2	Definitive	Cyanide	Colorimetric	TestAmerica , Burlington , VT	N
L-8	USEPA 1613B	Definitive	PCDD/PCDFs	HRGC/ HRMS	Vista Analytical	Y
L-9	USEPA 1668A	Definitive	PCB Congener s	HRGC /HRMS	Vista Analytical	Y
L-10	USEPA 8151A	Definitive	Chlorinated Herbicides	GC/ECD	TestAmerica , Burlington , VT	Y
L-11	Lloyd Kahn (USEPA Region 2)	Definitive	POC (filter)	Combustion/thermal conductivity	TestAmerica , Bur lington , VT	Y
L-11	Lloyd Kahn (USEPA Region 2)	Definitive	TOC (solid)	Combustion/ thermal conductivity	TestAmerica , Burlington , VT	N
L-12	USEPA 9060	Definitive	TOC (liquid)	Combustion or oxidation	TestAmerica , Burlington , VT	N
L-12	USEPA 9060	Definitive	DOC	Combustion or oxidation	TestAmerica, Burlington, VT	N
L-13	OQA-QAM-025- 10/91 Rev. 6 (4/24/06)	Definitive	TEPH	GC/FID	TestAmerica, Burlington, VT	N
L-14	ASTM, D4464	Definitive	Grain Size	Laser	TestAmerica, Burlington, VT	N
L-15	SM 2540D	Definitive	TSS	Gravimetric	TestAmerica, Burlington, VT	Y
L-16	SM 2540C	Definitive	TDS	Gravimetric	TestAmerica, Burlington, VT	Y
L-17	Project -Specific Modifications to Water Sample Preparation Prior to Analysis of Semivolatile Organics	Definitive	Semivolatile Organic s	NA	TestAmerica, Burlington, VT	N
L-18	Project -Specific Modifications to Water Sample Preparation Prior to Analysis of Semivolatile SIM	Definitive	Semivolatile Organics (SIM)	NA	TestAmerica , Burlington , VT	N
L-19	Project -Specific Modifications to Water Sample Preparation and to Analysis of Organochlorine Pesticides	Definitive	Organochlorine Pesticides	NA	Vista Analytical	N

See the last page of Worksheet #23-1 for a description of footnotes .

QAPP Worksheet #23-1
Analytical Method/SOP References (Continued)

Reference Number	Analytical Method/SOP	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-20	Project-Specific Modifications to Water Sample Preparation Prior to Analysis of PCDD/PCDFs	Definitive	PCDD/PCDFs	NA	Vista Analytical	N
L-21	Project-Specific Modifications to Water Sample Preparation Prior to Analysis of PCB Congeners	Definitive	PCB Congeners	NA	Vista Analytical	N
L-22	Project-Specific Modifications to Lloyd Kahn to accommodate the determination of TOC on filtered particulates (POC)	Definitive	LSM only POC and DOC	Filtration Apparatus	TestAmerica, Burlington, VT	N
L-23	Project-Specific Modifications to LSM Particulate Sample Preparation (LSM Filters) Prior to Analysis of; PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Semivolatile Organics, Aroclor PCB, and Chlorinated Herbicides	Definitive	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Semivolatile Organics SIM, Semivolatile Organics, Aroclor PCBs, and Chlorinated Herbicides	NA	TestAmerica, Burlington, VT Vista Analytical	N
L-24	LSM Bulk Sample Filtration, Rev. 0, July 2010	Definitive	PCDD/PCDFs, PCB Congeners, Organochlorine Pesticides, Semivolatile Organics (SIM), Semivolatile Organics, Aroclor PCBs, and Chlorinated Herbicides	Filtration Apparatus	TestAmerica, Burlington [c]	N
L-25	Project-Specific Modifications for Preparation/Analysis of an Archival Extract for Aroclor PCB and Chlorinated Herbicides Analysis of Liquid Samples	Definitive	Aroclor PCBs and Chlorinated Herbicides	NA	TestAmerica, Burlington, VT	N
L-26	Project-Specific Modifications to HSM Particulate Sample Preparation and Analysis of Organochlorine Pesticides	Definitive	Organochlorine Pesticides	NA	Vista Analytical	N

Notes:
[a] Volatile organics are analyzed at the trace level in HSM dissolved, and whole water matrices.
[b] Test America, Burlington, VT laboratory-specific Standard Operating Procedure.
[c] LSM bulk sample filtration will occur at the TestAmerica, Burlington, VT laboratory.

ASTM = American Society for Testing and Materials
CLP = Contract Laboratory Program
CVAFS = cold vapor atomic fluorescence spectrometry
DOC = dissolved organic carbon
GC/ECD = gas chromatography electron capture detector
GC/FID = gas chromatography flame ionization detector
GC/MS = gas chromatography/mass spectrometry
HRGC/HRMS = high resolution gas chromatography/high resolution mass spectrometry
HSM = high-solids mass
ICP/MS = inductively coupled plasma mass spectrometry
NA = not applicable
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
POC = particulate organic carbon SIM = selective ion monitoring
SM = standard methods for the examination of water and wastewater
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
TSS = total suspended solids
USEPA = U.S. Environmental Protection Agency
LSM = low-solids mass

QAPP Worksheet #23-2
Analytical Method/SOP References Additional Text to Supplement

Modifications to SOM01.2 for Semivolatile Organics Analyses (L-17):

Several modifications will be applied to SOM01.2 during semivolatile organics analyses of water samples and are generally described below. These modifications will be applied to water samples only (whole water, high-solids mass [HSM] dissolved, low-solids mass [LSM] dissolved , and rinse/equipment blanks). The sample size will be increased from 1,000 milliliters (mL) to 2,500 mL, while the final extract volume will be reduced from 1,000 microliters (µL) to 500 µL in order to decrease the achievable project quantitation limit. Note: method performance criteria outlined in Worksheet #12 for analytical procedure L-1 (SOM01.2) will be in effect for these modified analyses. Project -specific Standard Operating Procedure (SOP) L-17 delineates the details of these modifications.

Modifications to SOM01.2 for Semivolatile Organics (Select Ion Monitoring [SIM]) Analyses (L-18):

Several modificati ons will be applied to SOM01.2 during semivolatile organics (SIM) analyses of water samples , which are described below. These modifications will be applied to water samples only (whole water, HSM dissolved, LSM dissolved , and rinse/equipment blanks). The sample size will be increased from 1,000 mL to 2,500 mL, in order to decrease the achievable project quantitation limit. Note: method performance criteria outlined in Worksheet #12 for analytical procedure L-1 (SOM01.2) will be in effect for these modified analyses. Project -specific SOP L-18 delineates the details of these modifications. An additional modification will address the calibration standards. Calibration standards will be prepared at a minimum of five concentration levels that are applicable to the project quantitation limits. The five levels are projected to be as follows: 0.02 nanograms per microliter (ng/µL), 0.10 ng/µL, 0.2 ng/µL, 0.4 ng/µL, and 0.8 ng/µL. These levels are based upon the final volume of 500 µL. A method detection limit study will be performed before the samples are run to confirm the instruments sensitivity and achievable standard range.

Modifications to USEPA 1699 for Organochlorine Pesticides Analyses (L-19):

Several modifications will be applied to U.S. Environmental Protection Agency (USEPA) 1699 during organochlorine pesticides analyses of water samples, which are described below. These modifications will be applied to water samples only (whole water, HSM dissolved, LSM dissolved , and rinse/equipment blanks). The sample size will be increased from 1,000 mL to 2,500 mL in order to decrease the achievable project quantitation limit. Note: method performance criteria outlined in Worksheet #12 for analytical procedure L-2 (USEPA 1699) will be in effect for these modifi ed analyses. Project -specific SOP L-19 delineates the details of these modifications.

Modifications to USEPA 1613B for (Polychlorinated dibenzo-*p*-dioxins/Polychlorinated dibenzofurans [PCDD/PCDF]) Analyses (L-20):

One modification will be applied to USEPA 1613B during PCDD/PCDF analyses of water samples , which is described below. This modification will be applied to water samples only (whole water, HSM dissolved, LSM dissolved , and rinse/equipment blanks). The sample size will be increased from 1,000 mL to 10,000 mL in order to decrease the achievable project quantitation limit. Note: method performance criteria outlined in Worksheet #12 for analytical procedure L-8 (USEPA 1613B) will be in effect for these modified analyses. Project -specific SOP L-20 delineates the details of this modification.

QAPP Worksheet #23-2
Analytical Method/ SOP References Additional Text to Supplement (Continued)

Modifications to USEPA 1668B for Polychlorinated Biphenyls (PCB) Congeners Analyses (L-21):

Several modifications will be applied to USEPA 1668B during PCB congeners analyses of water samples, which are described below. These modifications will be applied to water samples only (whole water, HSM dissolved, LSM dissolved, and rinse/equipment blanks). The sample size will be increased from 1,000 mL to 5,000 mL, while the final extract volume will be reduced from 100 µL to 20 µL in order to decrease the achievable project quantitation limit. Note: method performance criteria outlined in Worksheet #12 for analytical procedure L-9 (USEPA 1668B) will be in effect for these modified analyses. Project-specific SOP L-21 delineates the details of these modifications.

Modifications to Lloyd Kahn Method for Particulate Organic Carbon (POC) (L-22):

Several modifications will be applied to the Lloyd Kahn analytical method during POC analyses required in the LSM analytical scope and they are described below. These modifications will be applied to bulk water samples that are filtered, thereby capturing particulates during the LSM sampling technique. A 4,000 mL bulk water sample is filtered. The filter is allowed to dry. A biopsy paper punch is used to collect four sub-samples (cores) from the dried filter. Each core is folded and placed in a 5 millimeter (mm) x 9 mm tin capsule and subsequently analyzed via the Lloyd Kahn analytical method. Project-specific SOP L-22 delineates the details of these modifications.

Modifications to SM 2540 D and SM 2540 C for Total Suspended Solids (TSS) and Total Dissolved Solids (TDS) Analyses :

Several modifications will be applied to both Standard Methods (SM) 2540 D and 2540 C. These methods will be modified to include the use of the entire field sample volume in the TSS/TDS analyses. Through this modification, sub-sampling will not occur, providing more representative TSS/TDS analytical results. Note: method performance criteria outlined in Worksheet #12 for analytical procedures L-15 and L-16 (SM 2540 D and SM 2540 C) will be in effect for these modified analyses. The additional modification will be regarding pore size and diameter of the filters specified in methods SM2540D and SM2540C. The 0.7 micrometer pore size filter used in the analyses will have a 142 millimeter diameter.

A project-specific SOP was not developed to provide greater detail regarding this modification because the required modification is adequately described above.

Modifications to USEPA 1638 for Metals Analyses

The metals analytical group will be determined via USEPA 1638. However, the analytical protocol will be expanded to include the following additional target analytes:

Aluminum	Iron
Arsenic	Magnesium
Barium	Manganese
Beryllium	Potassium
Calcium	Sodium
Chromium	Titanium
Cobalt	Vanadium

QAPP Worksheet #23-2
Analytical Method/ SOP References Additional Text to Supplement (Continued)

Modifications to SOM01.2 for Semivolatile Organics and Aroclor PCB analyses, Semivolatile SIM Analyses, USEPA 1699 for Organochlorine Pesticide Analyses, USEPA 1613B for PCDD/PCDF Analyses, USEPA 1668B for PCB Congener Analyses and 8151A for Chlorinated Herbicide Analyses of Particulate Samples when LSM is used as the Sample Collection Method (L-23):

Several modifications will be applied to the analytical methods listed in the reference above during analyses of particulate samples collected using the LSM sample collection method only. Modifications are related to extraction/preparation of filters containing particulate material prior to analysis , correlation to TSS measurements , and final calculation of concentration of target analytes present on the filters post-separation, based on measured TSS.

The following specific modifications will be applied to USEPA Method 1699 for organochlorine pesticides during preparation/analysis of the LSM particulate sample. The solvent system hexane:ethyl acetate 70:30 will replace toluene in the extraction procedure. Also, the concentration of the lowest calibration standard for the following six target analytes will be adjusted from those listed in USEPA Method 1699: Endosulfan I, Endosulfan II, Endosulfan Sulfate, Endrin Aldehyde, Endrin Ketone, and Methoxychlor.

The following specific modification will be applied to USEPA Method 1668B for PCB Congeners during the preparation/analysis of the LSM particulate sample using the secondary approach. The extract final volume will be modified from 20 µL to 50 µL.

Project -specific SOP L-23 delineates the details of these modifications.

The modification that addressed elimination of GPC from SVOC/SVOC SIM extract preparation procedure will be reviewed at the end of Phase I. Continued elimination of GPC in Phase II will depend on the results from Phase I.

Modifications to USEPA SOM01.2 for Aroclor PCB and Method 8151A for Chlorinated Herbicides, Whole Water, Low-Solids Mass Dissolved, and High-Solids Mass Dissolved (L-25):

Several modifications may be applied (as available options) to the analytical methods listed in the reference above during preparation/analysis of an archival extract for Aroclor PCBs and chlorinated herbicide analyses of liquid samples should analysis of archived extracts be deemed necessary. Project -specific SOP L-25 delineates the details of these optional modifications.

Modifications to USEPA Method 1699 for High-Solids Mass Particulate (L-26):

The following specific modifications will be applied to USEPA Method 1699 during preparation/analysis of the HSM particulate. The solvent system hexane:ethyl acetate 70:30 will replace toluene in the extraction procedure. Also, the concentration of the lowest calibration standard for the following six target analytes will be adjusted from those listed in USEPA Method 1699: Endosulfan I, Endosulfan II, Endosulfan Sulfate, Endrin Aldehyde, Endrin Ketone, and Methoxychlor. Project -specifc SOP L-26 delineates the details of these modifications.

QAPP Worksheet #28-1a
Whole Water Field Quality Control Samples

Matrix	Whole Water
Analytical Group	Semivolatile Organics, Volatile Organics, Aroclor PCBs, Organochlorine Pesticides, Semivolatile Organics (SIM), Cyanide, PCDD/PCDFs, PCB Congeners, Chlorinated Herbicides, TOC, TEPH, Grain Size, TSS, TDS, Metals, Mercury, and Methylmercury
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-2, L-4, L-5, L-6, L-7, L-8, L-9, L-10, L-12, L-13, L-14, L-15, L-16, L-17, L-18, L-19, L-20, L-21, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT, Vista Analytical, Brooks Rand Labs
Number of Samples Collected	See Worksheet #20-1a

QC Sample	Frequency Number	Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicates	1 field duplicate will be collected at a frequent of 1 per sample delivery group not to exceed 1 per 20 field samples per matrix and per method	Associated data will be critically assessed to determine the impact to data quality	Precision	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples
Trip Blank	1 trip blank will be included with each shipment of samples which contains volatile organics field samples	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL
Field Blank [a]	1 per sampling event	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL

See footnotes after Worksheet 28-1g for description.

QAPP Worksheet #28-1b
HSM Particulate Field Quality Control Samples

Matrix	HSM Particulate
Analytical Group	Semivolatile Organics, Volatile Organics, Aroclor PCBs, Organochlorine Pesticides, Semivolatile Organics (SIM), Cyanide, PCDD/PCDFs, PCB Congeners, Chlorinated Herbicides, TOC, TEPH
Concentration Level	Low
Sampling SOP	SOP-3, SOP -4
Analytical Method/SOP Reference	L-1, L-2, L-7, L-8, L-9, L-10, L-11, L-13, L-26
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT, Vista Analytical
Number of Samples Collected	See Worksheet #20-1b

QC Sample	Frequency Number	Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Rinsate Blank [b]	1 per decontamination event (not to exceed 1 per day)	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL
Field Duplicates	1 field duplicate will be collected at a frequent of 1 per sample delivery group not to exceed 1 per 20 field samples per matrix and per method	Associated data will be critically assessed to determine the impact to data quality	Precision	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples
Trip Blank	1 trip blank will be included with each shipment of samples which contains volatile organics field samples	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL
Field Blank [a,b]	1 per sampling event	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL

See footnotes after Worksheet 28-1g for description.

QAPP Worksheet #28-1c
HSM Dissolved Field Quality Control Samples

Matrix	HSM Dissolved
Analytical Group	Semivolatile Organics, Volatile Organics, Aroclor PCBs, Organochlorine Pesticides, Semivolatile Organics (SIM), Cyanide, PCDD/PCDFs, PCB Congeners, Chlorinated Herbicides, DOC, TEPH, TSS, TDS
Concentration Level	Low
Sampling SOP	SOP-3, SOP -4
Analytical Method/SOP Reference	L-1, L-2, L-7, L-8, L-9, L-10, L-12, L-13, L-15, L-16, L-17, L-18, L-19, L-20, L-21, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analyti cal Organization	TestAmerica, Burlington, VT, Vista Analytical
Number of Samples Collected	See Worksheet #20-1c

QC Sample	Frequency Number	Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Blank [a]	1 per sampling event	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL
Field Duplicates	1 field duplicate will be collected at a frequent of 1 per sample delivery group not to exceed 1 per 20 field samples per matrix and per method	Associated data will be critically assessed to determine the impact to data quality	Precision	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples.
Trip Blank	1 trip blank will be included with each shipment of samples which contains volatile organics field samples	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL

See footnotes after Worksheet 28-1g for description.

QAPP Worksheet #28-1d
LSM Particulate Field Quality Control Samples

Matrix	LSM Particulate
Analytical Group	Semivolatile Organics, Aroclor PCBs, Organochlorine Pesticides, Semivolatile Organics (SIM), PCDD/PCDFs, PCB Congeners, Chlorinated Herbicides, POC
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4, SOP-6, SOP-8
Analytical Method/SOP Reference	L-1, L-2, L-8, L-9, L-10, L-11, L-22, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT, Vista Analytical
Number of Samples Collected	See Worksheet #20-1d

QC Sample	Frequency Number	Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Equipment Blank[c]	1 equipment blank will be collected upon initiation of LSM bulk sample separation, and a minimum of one per sample processing batch thereafter	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL
Field Duplicates	1 field duplicate will be collected at a frequent of 1 per sample delivery group not to exceed 1 per 20 field samples per matrix and per method	Associated data will be critically assessed to determine the impact to data quality	Precision	RPD ≤50% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples
Field Blank[a]	1 per sampling event	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL

See footnotes after Worksheet 28-1g for description.

QAPP Worksheet #28-1e
LSM Dissolved Field Quality Control Samples

Matrix	LSM Dissolved
Analytical Group	Semivolatile Organics, Aroclor PCBs, Organochlorine Pesticides, Semivolatile Organics (SIM), PCDD/PCDFs, PCB Congeners, Chlorinated Herbicides , DOC, TSS, TDS
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-2, L-8, L-9, L-10, L-12, L-15, L-16, L-17, L-18, L-19, L-20, L-21, L-24, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT, Vista Analytical
Number of Samples Collected	See Worksheet #20-1e

QC Sample	Frequency Number	Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Equipment Blank [c]	1 equipment blank will be collected upon initiation of LSM bulk sample separation, and a minimum of one per sample processing batch thereafter	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL
Field Duplicates	1 field duplicate will be collected at a frequent of 1 per sample delivery group not to exceed 1 per 20 field samples per matrix and per method	Associated data will be critically assessed to determine the impact to data quality	Precision	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples
Field Blank [a]	1 per sampling event	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL

See footnotes after Worksheet 28-1g for description.

QAPP Worksheet #28-1f
Grab Sample Field Quality Control Samples

Matrix	Grab Sample Whole Water and Grab Sample Dissolved
Analytical Group	Metals, Mercury, Methyl mercury
Concentration Level	Low
Sampling SOP	SOP-5
Analytical Method/SOP Reference	L-4, L-5, L-6
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Brooks Rand Labs
Number of Samples Collected	See Worksheet #20-1f

QC Sample	Frequency Number	Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Blank [a]	1 per sampling event	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL
Field Duplicates	1 field duplicate will be collected at a frequent of 1 per sample delivery group not to exceed 1 per 20 field samples per matrix and per method	Associated data will be critically assessed to determine the impact to data quality	Precision	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples.
Trip Blank	1 trip blank will be included with each shipment of samples which contains field samples for metals, mercury, or methylmercury	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL

See footnotes after Worksheet 28-1g for description.

QAPP Worksheet #28-1g
Grab Sample Whole Water Field Quality Control Samples

Matrix	Grab Sample Whole Water
Analytical Group	TSS/TDS
Concentration Level	Low
Sampling SOP	SOP-3
Analytical Method/SOP Reference	L-15, L-16
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
Number of Samples Collected	See Worksheet #20-1g

QC Sample	Frequency Number	Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicates	1 field duplicate will be collected at a frequent of 1 per sample delivery group not to exceed 1 per 20 field samples per matrix and per method	Associated data will be critically assessed to determine the impact to data quality	Precision	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples
Field Blank [a]	1 per sampling event	Associated data will be critically assessed to determine the impact to data quality	Accuracy/Bias Contamination	No target compounds ≥PQL

Notes:
[a] Field blanks will be collected in association with various matrix types. Whole water, HSM dissolved, LSM particulate, and LSM dissolved will share bulk sample container liner field blank, HSM particulate and HSM dissolved will share a field blank from the continuous flow centrifuge. A field blank will also be associated with the grab sample whole water and grab sample dissolved.
[b] The rinse blank will be applied to HSM particulate.
[c] The LSM bulk sample separation equipment blank will be applied to both LSM particulate and dissolved -phases.
Upon completion of Phase I, USEPA will evaluate the precision associated with field duplicate samples collected during Phase I to determine if, during implementation of Phase II, laboratory corrective actions are warranted based upon the field duplicate precision achieved during Phase I.

DOC = dissolved organic carbon
HSM = high-solid mass
LSM = low-solid mass
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins and dibenzofurans
POC = particulate organic carbon
PQL= project quantitation limit
QC = quality control
RPD = relative percent difference
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbon
TOC = total organic carbon
TSS = total suspended solids
USEPA = U.S. Environmental Protection Agency

QAPP Worksheet #28-1
Field Quality Control Samples (Continued)

Description of Terms:

Rinsate Blank

Rinsate blanks check for sample contamination caused by reuse of decontaminated sampling equipment, as well as the sampling process and transportation.

Rinsate blanks are blanks collected by pouring de-ionized water or solvent, whichever is appropriate to the contaminants of interest, over the sampling equipment after it has been cleaned in the field. Rinsate blanks are submitted for testing for each type of equipment used each day a decontamination event is carried out not to exceed one per day. For all methods except volatile organic analysis, the same aliquot of water or solvent may be poured over all sampling equipment used for the collection of samples for that method. For volatile organic analysis, a rinsate blank must be collected from each piece of sampling equipment.

Field Duplicate

Field duplicate sub-samples are samples to be collected from the bulk material as the original samples, which are assigned separate and discrete sample numbers. Field duplicate sub-samples will be collected in the majority of instances, exceptions will be grab TSS/TDS and target analyte list metals, mercury, and methylmercury, which will be co-located field duplicates.

Trip Blank

A trip blank is a sample matrix that is as free of volatile analytes (or trace metals, where appropriate) as possible and is transported with the samples to the laboratory without being opened. This serves as a check on sample contamination during transport, shipping, and storage before analysis.

Field Blank

Field blanks are blanks collected by recirculating (or circulating in the case of the continuous flow centrifuge) deionoized water through the sample collection equipment in the field. This serves as a check on contamination prior to sampling collection processing.

Equipment Blank

Equipment blanks monitor contamination that may be associated with the filters and equipment used during separation of the LSM bulk sample into the LSM dissolved- and LSM particulate-phases.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-1, L-17
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery [a]**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	16 per sample	Phenol-d_5	39-106	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Phenol-d_5	39-106
		Bis(2-chloroethyl)ether-d_8	40-105			Bis(2-chloroethyl)ether-d_8	40-105
		2-Chlorophenol-d_4	41-106			2-Chlorophenol-d_4	41-106
		4-Methylphenol-d_8	25-111			4-Methylphenol-d_8	25-111
		Nitrobenzene -d_5	43-108			Nitrobenzene -d_5	43-108
		2-Nitrophenol -d_4	40-108			2-Nitrophenol -d_4	40-108
		2,4-Dichlorophenol-d_3	37-105			2,4-Dichlorophenol-d_3	37-105
		4-Chloroaniline-d_4	1-145			4-Chloroaniline-d_4	1-145
		Dimethylphthalate-d_6	47-114			Dimethylphthalate-d_6	47-114
		Acenaphthylene-d_8	41-107			Acenaphthylene-d_8	41-107
		4-Nitrophenol -d_4	33-116			4-Nitrophenol -d_4	33-116
		Fluorene-d_{10}	42-111			Fluorene-d_{10}	42-111
		4,6-Dinitro -2-methyl phenol-d_2	22-104			4,6-Dinitro -2-methylphenol-d_2	22-104
		Anthracene-d_{10}	44-110			Anthracene-d_{10}	44-110
		Pyrene -d_{10}	52-119			Pyrene -d_{10}	52-119
		Benzo(a)pyrene-d_{12}	32-121			Benzo(a)pyrene-d_{12}	32-121

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-1, L-17
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per extraction batch [b]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	Volatile Organics
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method / SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Ac ceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	13 per sample	Vinyl chloride-d_3	65-131	The labora tories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, qualify data as needed.	Accuracy/Bias	Vinyl chloride-d_3	65-131
		Chloroethane -d_5	71-131			Chloroethane -d_5	71-131
		1,1-Dichloroethene-d_2	55-104			1,1-Dichloroethene-d_2	55-104
		2-Butanone-d_5	49-155			2-Butanone-d_5	49-155
		Chloroform -d	78-121			Chloroform -d	78-121
		1,2-Dichloroethane-d_4	78-129			1,2-Dichloroethane-d_4	78-129
		Benzene-d_6	77-124			Benzene-d_6	77-124
		1,2-Dichloropropane- d_6	79-124			1,2-Dichloropropane- d_6	79-124
		Toluene-d_8	77-121			Toluene-d_8	77-121
		trans -1,3-Dichloropropene-d_4	73-121			trans -1,3-Dichloropropene-d_4	73-121
		2-Hexanone-d $_5$	28-135			2-Hexanone-d $_5$	28-135
		1,1,2,2-Tetrachlorooethane- d_2	73-125			1,1,2,2-Tetrachlorooethane- d_2	73-125
		1,2-Dichlorobenzene-d_4	80-131			1,2-Dichlorobenzene-d_4	80-131
Method Blanks	1 per 12 hour sequence	No target compounds ≥ PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥ PQL	

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/ SOP Reference	L-1, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compound	**% Recovery**			**Surrogate Compound**	**% Recovery**
Surrogate Spikes	2 per sample	Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150
		Compound	**% Recovery**			**Compound**	**% Recovery**
Laboratory Control Sample	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	50-150 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aroclor -1016 Aroclor -1260	50-150 50-150

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-1, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sampl e is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Instrument Blanks	1 per 12 hour sequence	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-2, L-19
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch [a]	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2.	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2.
Instrument Blanks	1 per 12 hour sequence	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed. Accuracy/Bias Contamination	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2a for foot notes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-6
Analytica l Method/SOP Reference	L-2, L-19
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per USEPA Method 1613B	Per L-2	Investigate and recalibrate , if necessary , per L-2	Accuracy/Bias	Per L-2

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/Rinse/Equipment Blank
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-2, L-19
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12-hour period per L-2	Per L-2	Investigate and recalibrate, if necessary, per L-2	Accuracy/Bias	Per L-2
Labeled Compound Spike	1 per sample	Per L-2	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2
Labeled Internal Standard	1 per sample	Per L-2	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	Semivolatile Organics (SIM)
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-1, L-18
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	5 per sample	Naphthalenel-d_8 Acenaphthene- d_{10} Phenanthrene-d $_{10}$ Chrysene-d $_{12}$ Perylene-d_{12}	20-130 20-130 20-130 20-130 20-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Naphthalenel-d_8 Acenaphthene- d_{10} Phenanthrene-d $_{10}$ Chrysene -d_{12} Perylene-d_{12}	20-130 20-130 20-130 20-130 20-130
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sampl e is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Trip/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/ Trip/ Equipment Blank
Analytical Group	Metals, Mercury, Methyl mercury, and Cyanide
Concentration Level	Low
Sampling SOP	SOP-5, SOP-6
Analytical Method/SOP Reference	L-4, L-5, L-6 L-7
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT/ Brooks Rand Labs
No. of Samples Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Analyte	**% Recovery**			**Analyte**	**% Recovery**
Ongoing Precision and Recovery	1 per digestion/distillation batch [a]	Aluminum	80-120	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aluminum	80-120
		Antimony	79-122			Antimony	79-122
		Cadmium	84-113			Cadmium	84-113
		Copper	51-145			Copper	51-145
		Cyanide	80-120			Cyanide	80-120
		Lead	72-143			Lead	72-143
		Mercury	77-123			Mercury	77-123
		Methyl Mercury	67-133			Methyl Mercury	67-133
		Nickel	68-134			Nickel	68-134
		Selenium	59-149			Selenium	59-149
		Silver	74-119			Silver	74-119
		Thallium	64-137			Thallium	64-137
		Zinc	46-146			Zinc	46-146
Method Blanks	1 per digestion/distillation batch [a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Trip/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/ Trip/ Equipment Blank
Analytical Group	Metals, Mercury, Methyl mercury, and Cyanide
Concentration Level	Low
Sampling SOP	SOP-5, SOP-6
Analytical Method/SOP Reference	L-4, L-5, L-6, L-7
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT/ Brooks Rand Labs
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Instrument Blanks	Per analytical method	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample digestates. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Initial Precision and Recovery (metals only)	At initial setup or when corrective action is taken, which may change calibration per L-4, L-5, L-6	Per L-4, L-5, L-6	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits.	Accuracy/Bias	Per L-4, L-5, L-6
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-4, L-5, L-6, and L-7	Per L-4, L-5, L-6, and L-7	The laboratory must follow all corrective actions required by L-4, L-5, L-6, and L-7.	Accuracy/Bias	Per L-4, L-5, L-6, and L-7
Calibration Verification	Per L-4, L-5, L-6, and L-7	Per L-4, L-5, L-6, and L-7	Investigate and recalibrate, if necessary, per L-4, L-5, L-6, and L-7.	Accuracy/Bias	Per L-4, L-5, L-6, and L-7

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-8, L-20
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch [a]	All target compound concentrations must fall within range provided in Table 6 of L-8.	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound concentrations must fall within range provided in Table 6 of L-8.
Method Blanks	1 per extraction batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/Rinse/Equipment Blank
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-8, L-20
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12-hour period per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8
Labeled Compound Spike	1 per sample	Per L-8	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits refer to L-8	Accuracy/Bias	Per L-8
Labeled Internal Standard	1 per sample	Per L-8	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits refer to L-8	Accuracy/Bias	Per L-8

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-9, L-21
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch [a]	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of L-9
Method Blanks	1 per extraction batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-9	Per L-9	The laboratory must follow all corrective actions required by L-9	Accuracy/Bias	Per L-9

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/Rinse/Equipment Blank
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-9, L-21
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12-hour period per L-9	Per L-9	The laboratory must follow all corrective actions required by L-9.	Accuracy/Bias	Per L-9
Labeled Compound Spike	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to L-9.	Accuracy/Bias	Per L-9
Labeled Internal Stand ards	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to L-9.	Accuracy/Bias	Per L-9

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	Chlorinated Herbicides
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-10, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Surrogate Spikes	1 per sample	**Surrogate Compounds** DCAA	**% Recovery** 50-120	The laboratories should evaluate potential corrective actions and implement, as appropriate. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	**Surrogate Compounds** DCAA	**% Recovery** 50-120
Laboratory Control Sample	1 per extraction batch[a]	**Compound** All target analytes	**% Recovery** 70-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	**Compound** All target analytes	**% Recovery** 70-130
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	TOC
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-12
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmeric a, Burlington, VT
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample	1 per analytical batch [a]	% Recovery 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 50-150
Method Blanks	1 per analytical batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Instrument Blanks	1 per 10 determinations	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected field samples. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/ Rinse/Equipment Blank
Analytical Group	TEPH
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-13
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measuremen t Performance Criteria	
Surrogate Spikes	2 per sample	**Surrogate Compounds** Chlorobenzene Ortho-terphenyl	**% Recovery** 60-120 60-120	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	**Surrogate Compounds** Chlorobenzene Ortho-terphenyl	**% Recovery** 60-120 60-120
Laboratory Control Sample	1 per extraction batch [a]	**Compound** #2 Diesel	**% Recovery** 70-120	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	**Compound** #2 Diesel	**% Recovery** 70-120
Method Blanks	1 per extraction batch [a]	No target compoun ds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Field/Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Matrix	Field/Rinse/Equipment Blank
Analytical Group	TSS and TDS
Concentration Level	Low
Sampling SOP	SOP-6
Analytical Method/SOP Reference	L-15, L-16
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See all of Worksheets #20-1 and Worksheets #20-2

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample	1 per analytical batch [a]	% Recovery 75-125	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 75-125
Method Blank	1 per analytical batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	No target compounds ≥PQL
Laboratory Duplicate	1 per analytical batch [a]	RPD ≤20%	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision - Lab	RPD ≤20%

See the last page of Worksheet #28-2a for footnotes.

QAPP Worksheet #28-2a
Rinse/Equipment Blank Laboratory Quality Control Samples (Continued)

Notes:

[a] Per data validation SOP (USEPA Region 2 SOP HW-35, Revision 1) during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%.
[b] A batch is defined as a group of up to 20 samples of the same matrix, prepared at the same time, using the same procedure.

DCAA = 2,4-Dichlorophenylacetic acid
OPR = ongoing precision and recovery
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/dibenzofurans
PQL = project quantitation limit
QA = quality assurance
QC = quality control
RPD = relative percent difference
SOP = Standard Operating Procedure
SIM = selective ion monitoring
TBD = to be determined
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
TSS = total suspended solids
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples

Matrix	HSM Particulate
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	Phenol	<35	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	Phenol	<35
		2-Chlorophenol	<50			2-Chlorophenol	<50
		N-Nitroso -di-n-propylamine	<38			N-Nitroso -di-n-propylamine	<38
		4-Chloro-3-methylphenol	<33			4-Chloro-3-methylphenol	<33
		Acenapht hene	<19			Acenaphthene	<19
		4-Nitrophenol	<50			4-Nitrophenol	<50
		2,4-Dinitrotoluene	<47			2,4-Dinitrotoluene	<47
		Pentachlorophenol	<47			Pentachlorophenol	<47
		Pyrene	<36			Pyrene	<36
		Compound	**% Recovery**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field samp le is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.		**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	Phenol	26-90		Accuracy/Bias	Phenol	26-90
		2-Chlorophenol	25-102			2-Chlorophenol	25-102
		N-Nitroso -di-n-propylamine	41-126			N-Nitroso -di-n-propylamine	41-126
		4-Chloro-3-methylphenol	26-103			4-Chloro-3-methylphenol	26-103
		Acenaphthene	31-137			Acenaphthene	31-137
		4-Nitrophenol	11-114			4-Nitrophenol	11-114
		2,4-Dinit rophenol	28-89			2,4-Dinitrophenol	28-89
		Pentachlorophenol	17-109			Pentachlorophenol	17-109
		Pyrene	35-142			Pyrene	35-142

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery [b]**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.		**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	16 per sample	Phenol-d_5	17-103		Accuracy/Bias	Phenol-d_5	17-103
		Bis(2-chloroethyl)ether-d_8	12-98			Bis(2-chloroethyl)ether-d_8	12-98
		2-Chlorophenol-d_4	13-101			2-Chlorophenol-d_4	13-101
		4-Methylphenol-d_8	8-100			4-Methylphenol-d_8	8-100
		Nitrobenzene -d_5	16-103			Nitrobenzene -d_5	16-103
		2-Nitrophenol -d_4	16-104			2-Nitrophenol -d_4	16-104
		2,4-Dichlorophenol-d_3	23-104			2,4-Dichlorophenol-d_3	23-104
		4-Chloroaniline-d_4	1-145			4-Chloroaniline-d_4	1-145
		Dimethylphthalate-d_6	43-111			Dimethylphthalate-d_6	43-111
		Acenaphthylene-d_8	20-97			Acenaphthylene-d_8	20-97
		4-Nitrophenol -d_4	16-166			4-Nitrophenol -d_4	16-166
		Fluorene-d_{10}	40-108			Fluorene-d_{10}	40-108
		4,6-Dinitro -2-methylphenol-d_2	1-121			4,6-Dinitro -2-methylphenol-d_2	1-121
		Anthracene-d_{10}	22-98			Anthracene-d_{10}	22-98
		Pyrene -d_{10}	50-120			Pyrene -d_{10}	50-120
		Benzo(a)pyrene-d_{12}	43-111			Benzo(a)pyrene-d_{12}	43-111

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sampl e is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Volatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmeric a, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, qualify data as needed.		**Compound**	**RPD**
Matrix Spike Duplic ate	1 per extraction batch[a]	1,1-Dichloroethene	<22		Precision-Lab	1,1-Dichloroethene	<22
		Trichloroethene	<24			Trichloroethene	<24
		Benzene	<21			Benzene	<21
		Toluene	<21			Toluene	<21
		Chlorobenzene	<21			Chlorobenzene	<21
		Compound	**% Recovery**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, qualify data as needed.		**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	1,1-Dichloroethene	59-172		Accuracy/ Bias	1,1-Dichloroethene	59-172
		Trichloroethene	62-137			Trichloroethene	62-137
		Benzene	66-142			Benzene	66-142
		Toluene	59-139			Toluene	59-139
		Chlorobenzene	60-133			Chlorobenzene	60-133

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Volatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	13 per sample	Vinyl chloride-d_3	68-122	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, qualify data as needed.	Accuracy/Bias	Vinyl chloride-d_3	68-122
		Chloroethane -d_5	61-130			Chloroethane -d_5	61-130
		1,1-Dichloroethene-d_2	45-132			1,1-Dichloroethene-d_2	45-132
		2-Butanone-d_5	20-182			2-Butanone-d_5	20-182
		Chloroform -d	72-123			Chloroform -d	72-123
		1,2-Dichloroethane-d_4	79-122			1,2-Dichloroethane-d_4	79-122
		Benzene-d_6	80-121			Benzene-d_6	80-121
		1,2-Dichloropropane- d_6	74-124			1,2-Dichloropropane- d_6	74-124
		Toluene-d_8	78-121			Toluene-d_8	78-121
		trans-1,3-Dichloropropene-d_4	72-130			trans-1,3-Dichloropropene-d_4	72-130
		2-Hexanone-d_5	17-184			2-Hexanone-d_5	17-184
		1,1,2,2-Tetrachloroethane- d_2	56-161			1,1,2,2-Tetrachloroethane- d_2	56-161
		1,2-Dichlorobenzene-d_4	70-131			1,2-Dichlorobenzene-d_4	70-131
Method Blanks	1 per 12 hour sequence	No target compounds ≥ PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥ PQL	

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	<15 <20	The laboratorie s should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	Aroclor -1016 Aroclor -1260	<15 <20
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	29-135 29-135	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aroc lor-1016 Aroclor -1260	29-135 29-135
		Surrogate Compound	**% Recovery**			**Surrogate Compound**	**% Recovery**
Surrogate Spikes	2 per sample	Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**% Recovery**			**Compound**	**% Recovery**
Laboratory Control Sample	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	50-150 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aroclor -1016 Aroclor -1260	50-150 50-150
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sampl e is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	
Instrument Blanks	1 per 12 hour sequence	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-26
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<25	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<25
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	50-150

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-26
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measure ment Performance Criteria
Ongoing Precision Recovery	1 per extraction batch [a]	All target compound conentrations must fall within the acceptance criteria in L-2	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound conentrations must fall within the acceptance criteria in L-2
Method Blanks	1 per extraction batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Instrument Blanks	1 per 12 hour sequence	No target compounds ≥PQ L	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-26
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See all of Worksheets #20-1b and Worksheets #20-2b

QC Sample	Frequency/Num ber	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-2	Per L-2	Investigate and recal ibrate , if necessary , per L-2	Accuracy/Bias	Per L-2
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12-hour period per L-2	Per L-2	Investigate and recalibrate ,if necessary , per L-2	Accuracy/Bias	Per L-2
Labeled Compound Spike	1 per sample	Per L-2	The laboratory should review their protocol and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2
Labeled Internal Standard	1 per sample	Per L-2	The laboratory should review their protocol and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Semivolatile Organics (SIM)
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.		**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<40		Precision- Lab	All target analytes	<40
		Compound	**% Recovery**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.		**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140		Accuracy/ Bias	All target analytes	60-140

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Semivolatile Organics (SIM)
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	5 per sample	Acenaphthene- d_{10} Chrysene-d_{12} Napthalene-d_8 Perylene-d_{12} Phenanthrene -d_{12}	20-130 20-130 20-130 20-130 20-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/ Bias	Acenaphthene- d_{10} Chrysene-d_{12} Napthalene-d_8 Perylene-d_{12} Phenanthrene -d_{12}	20-130 20-130 20-130 20-130 20-130
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Cyanide
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-7
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Analyte	% Recovery			Analyte	% Recovery
Matrix Spike	1 per digestion/distill ation batch [a]	All target analytes	75-125	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	75-125
Laboratory Duplicate	1 per digestion/distillation batch [a]	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples.		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples.	
Laboratory Control Sample	1 per digestion/distillation batch [a]	All analyte concentrations must fall within the certified range of acceptance as noted on Form VII of the laboratory data package.		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All analyte concentrations must fall within the certified range of acceptance as noted on Form VII of the laboratory data package.	

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Cyanide
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-7
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per digestion/distillation batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Instrument Blanks	Per analytical method	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample digestates. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch [a]	All target analytes	<50	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<50
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch [a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	60-140

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch[a]	All target compound concentrations must fall within range provided in Table 6 of L-8.	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound concentrations must fall within range provided in Table 6 of L-8.
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, West Sacramento, CA
No. of Samples Collected	See all of Worksheets #20-1b and Worksheets #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12-hour period per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8
Labeled Compound Spike	1 per sample	Per L-8	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits, refer to L-8	Accuracy/Bias	Per L-8
Labeled Internal Standard	1 per sample	Per L-8	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits, refer to L-8	Accuracy/Bias	Per L-8

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	86 target analytes	<50	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	86 target analytes	< 50
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration.	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration.	60-140

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch[a]	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 per L-9.	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 per L-9.
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytica l
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-9	Per L-9	Investigate and recalibrate, if necessary , per L-9	Accuracy/Bias	Per L-9
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12 hour period per L-9	Per L-9	Investigate and recalibrate, if necessary , per L-9	Accuracy/Bias	Per L-9
Labeled Compound Spike	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to protocol in L-9.	Accuracy/Bias	Per L-9
Labeled Internal Standards	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to protocol in L-9.	Accuracy/Bias	Per L-9

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Chlorinated Herbicides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-10
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<35	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision- Lab	All target analytes	<35
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/ Bias	All target analytes	60-140
		Surrogate Compound	**% Recovery**			**Surrogate Compound**	**% Recovery**
Surrogate Spikes	1 per sample	DCAA	50-120	The laboratories should evaluate potential corrective actions and implement, as appropriate. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/ Bias	DCAA	50-120

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	Chlorinated Herbicides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-10
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**% Recovery**			**Compound**	**% Recovery**
Laboratory Control Sample	1 per extraction batch[a]	All target analytes	70-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	70-130
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	TOC
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-11
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	1 per analytic al batch [a]	RPD ≤35%	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision- Lab	RPD ≤35%
Matrix Spike	1 per analytical batch [a]	% Recovery 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If suffic ient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 50-150

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	TOC
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-11
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurem ent Performance Criteria
Laboratory Control Sample	1 per analytical batch [a]	% Recovery 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 50-150
Method Blanks	1 per analytical batch [a]	No target compounds ≥PQL	The laboratories should review their protocol s and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contaminat ion	No target compounds ≥PQL
Instrument Blanks	1 per 10 determinations	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected field samples. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	TEPH
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-13
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See W orksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	#2 Diesel	70-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	#2 Diesel	70-130
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	2 per sample	Chlorobenzene Ortho-terphenyl	60-120 60-120	The laboratories should review their protoc ols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Chlorobenzene Ortho-terphenyl	60-120 60-120
Matrix Spike Duplicate	1 per extraction batch[a]	RPD <50%		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD <50%	

See the last page of Worksheet #28-2b for footnot es.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	HSM Particulate
Analytical Group	TEPH
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-13
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1b and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	% Recovery			Compound	% Recovery
Laboratory Control Sample	1 per extraction batch [a]	#2 Diesel	70-120	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	#2 Diesel	70-120
Method Blanks	1 per extraction batch [a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sampl e is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥ PQL	

See the last page of Worksheet #28-2b for footnotes.

QAPP Worksheet #28-2b
HSM Particulate Laboratory Quality Control Samples (Continued)

Notes:

[a] A batch is defined as a group of up to 20 samples of the same matrix, prepared at the same time, using the same procedure.
[b] Per data validation SOP (USEPA Region 2 SOP HW-35, Revision 1) during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%.

DCAA = 2-4-Dichlorophenylacrtic acid
HSM = high-solids mass
OPR = ongoing precision and recovery
PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SOP = Standard Operating Procedure
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
SIM = selective ion monitoring
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples

Matrix	HSM Dissolved/Whole Water
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-17
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	Phenol	<42	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	Phenol	<42
		2-Chlorophenol	<40			2-Chlorophenol	<40
		N-Nitroso -di-n-propylamine	<38			N-Nitroso -di-n-propylamine	<38
		4-Chloro-3-methylphenol	<42			4-Chloro -3-methylphenol	<42
		Acenaphthene	<31			Acenaphthene	<31
		4-Nitrophenol	<50			4-Nitrophenol	<50
		2,4-Dinitrotoluene	<38			2,4-Dinitrotoluene	<38
		Pentachlorophenol	<50			Pentachlorophenol	<50
		Pyrene	<31			Pyrene	<31
		Compound	**% Recovery**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	Phenol	12-110			Phenol	12-110
		2-Chlorophenol	27-123			2-Chlorophenol	27-123
		N-Nitroso -di-n-propylamine	41-116			N-Nitroso -di-n-propylamine	41-116
		4-Chloro-3-methylphenol	23-97			4-Chloro-3-methylphenol	23-97
		Acenaphthene	46-118			Acenaphthene	46-118
		4-Nitrophenol	10-80			4-Nitrophenol	10-80
		2,4-Dinitrotoluene	24-96			2,4-Dinitrophenol	24-96
		Pentachlorophenol	9-103			Pentachlorophenol	9-103
		Pyrene	26-127			Pyrene	26-127

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/ Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-17
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery [b]**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insuff icient sample is available, re-analyze extracts. Qualify data as needed.		**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	16 per sample	Phenol-d_5	39-106		Accuracy/Bias	Phenol-d_5	39-106
		Bis(2-chloroethyl)ether-d_8	40-105			Bis(2-chloroethyl)ether-d_8	40-105
		2-Chlorophenol-d_4	41-106			2-Chlorophenol-d_4	41-106
		4-Methylphenol-d_8	25-111			4-Methylphenol-d_8	25-111
		Nitrobenzene -d_5	43-108			Nitrobenzene -d_5	43-108
		2-Nitrophenol -d_4	40-108			2-Nitrophenol -d_4	40-108
		2,4-Dichlorophenol-d_3	37-105			2,4-Dichlorophenol-d_3	37-105
		4-Chloroaniline-d_4	1-145			4-Chloroaniline-d_4	1-145
		Dimethylphthalate-d_6	47-114			Dimethylphthalate-d_6	47-114
		Acenaphthylene-d_8	41-107			Acenaphthylene-d_8	41-107
		4-Nitrophenol -d_4	33-116			4-Nitrophenol -d_4	33-116
		Fluorene-d_{10}	42-111			Fluorene-d_{10}	42-111
		4,6-Dinitro -2-methylphenol-d_2	22-104			4,6-Dinitro -2-methylphenol-d_2	22-104
		Anthracene-d_{10}	44-110			Anthracene-d_{10}	44-110
		Pyrene -d_{10}	52-119			Pyrene -d_{10}	52-119
		Benzo(a)pyrene-d_{12}	32-121			Benzo(a)pyrene-d_{12}	32-121

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-17
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per extraction batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Volatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits.		**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch [a]	1,1-Dichloroethene	<14		Precision-Lab	1,1-Dichloroethene	<14
		Trichloroethene	<14			Trichloroethene	<14
		Benzene	<11	If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, qualify data as needed.		Benzene	<11
		Toluene	<13			Toluene	<13
		Chlorobenzene	<13			Chlorobenzene	<13
		Compound	**% Recovery**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits.		**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch [a]	1,1-Dichloroethene	61-145		Accuracy/Bias	1,1-Dichloroethene	61-145
		Trichloroethene	71-120			Trichloroethene	71-120
		Benzene	76-127	If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, qualify data as needed.		Benzene	76-127
		Toluene	76-125			Toluene	76-125
		Chlorobenzene	75-130			Chlorobenzene	75-130

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Volatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/ SOP Reference	L-1
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	13 per sample	Vinyl chloride-d_3	65-131	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, qualify data as needed.	Accuracy/Bias	Vinyl chloride-d_3	65-131
		Chloroethane -d_5	71-131			Chloroethane -d_5	71-131
		1,1-Dichloroethene-d_2	55-104			1,1-Dichloroethene-d_2	55-104
		2-Butanone-d_5	49-155			2-Butanone-d_5	49-155
		Chloroform -d	78-121			Chloroform -d	78-121
		1,2-Dichloroethane-d_4	78-129			1,2-Dichloroethane-d_4	78-129
		Benzene-d_6	77-124			Benzene-d_6	77-124
		1,2-Dichloropropane- d_6	79-124			1,2-Dichloropropane- d_6	79-124
		Toluene-d_8	77-121			Toluene-d_8	77-121
		trans -1,3-Dichloropropene-d_4	73-121			trans -1,3-Dichloropropene-d_4	73-121
		2-Hexanone-d $_5$	28-135			2-Hexanone-d $_5$	28-135
		1,1,2,2-Tetrachlorooethane- d_2	73-125			1,1,2,2-Tetrachlorooethane- d_2	73-125
		1,2-Dichlorobenzene-d_4	80-131			1,2-Dichlorobenzene-d_4	80-131
Method Blanks	1 per 12 hour sequence	No target compounds ≥ PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available , qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥ PQL	

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Who le Water
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/ SOP Reference	L-1, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington , VT
No. of Sample s Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	<15 <20			Aroclor -1016 Aroclor -1260	<15 <20
		Compound	**% Recovery**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insuffici ent sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	Aroclor -1016 Arocl or-1260	29-135 29-135			Aroclor -1016 Aroclor -1260	29-135 29-135
		Surrogate Compound	**% Recovery**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is avai lable, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	**Surrogate Compound**	**% Recovery**
Surrogate Spikes	2 per sample	Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150			Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**% Recovery**			**Compound**	**% Recovery**
Laboratory Control Sample	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	50-150 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aroclor -1016 Aroclor-1260	50-150 50-150
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	
Instrument Blanks	1 per 12-hour sequence	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-19
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All taraget analytes	<25	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All taraget analytes	<25
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	50-150

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-19
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Instrument Blanks	1 per 12-hour sequence	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-19
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch[a]	All target compound concentrations must fall with in the acceptance criteria provided in Table 5 of L-2	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-19
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-2	Per L-2	Investigate and recalibrate, if necessary, per L-9	Accuracy/Bias	Per L-2
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12-hour period per L-2	Per L-2	Investigate and recalibrate, if necessary, per L-9	Accuracy/Bias	Per L-2
Labeled Compound Spike	1 per sample	Per L-2	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2
Labeled Internal Standard	1 per sample	Per L-2	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples

Matrix	HSM Dissolved/Whole Water
Analytical Group	Semivolatile Organics (SIM)
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-18
Field Sampling Organizati on	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<40	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<40
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extrac t and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	60-140

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Semivolatile Organics (SIM)
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-18
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	5 per sample	Naphthalenel-d_8 Acenaphthene- d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene-d_{12}	20-130 20-130 20-130 20-130 20-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Naphthalenel-d_8 Acenaphthene- d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene-d_{12}	20-130 20-130 20-130 20-130 20-130
Method Blanks	1 per extraction batch [b]	No target compounds ≥ PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Cyanide
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-7
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Analyte	**% Recovery**			**Analyte**	**% Recovery**
Matrix Spike	1 per digestion/distillation batch [a]	All target analytes	75-125	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	75-125
Laboratory Duplicate	1 per digestion /distillation batch [a]	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples.		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples.	
Laboratory Control Sample	1 per digestion/distillation batch [a]	All analyte concentrations must fall within the certified range of acceptance as noted on Form VII of the laboratory data package.		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All analyte concentrations must fall within the certified range of acceptance as noted on Form VII of the laboratory data package.	

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Cyanide
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-7
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per digestion/distillation batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Instrument Blanks	Per analytical method	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample digestates. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8, L-20
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<50	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<50
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	60-140

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8, L-20
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch [a]	All target compound concentrations must fall within the acceptance criteria provided in Table 6 of L-8	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 6 of L-8
Method Blanks	1 per extraction batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8, L-20
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12-hour period per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8
Labeled Compound Spike	1 per sample	Per L-8	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits refer L-8	Accuracy/Bias	Per L-8
Labeled Internal Standards	1 per sample	Per L-8	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits refer L-8	Accuracy/Bias	Per L-8

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9, L-21
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	86 target analytes	<50	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	86 target analytes	<50
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration.	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration.	60-140

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9, L-21
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch [a]	All target compound concentrations must fall within the acceptance criteria provided in Table 6 of L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 6 of L-9
Method Blanks	1 per extraction batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9, L-21
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-9	Per L-9	Investigate and recalibrate, if necessary, per L-9	Accuracy/Bias	Per L-9
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12 hour period per L-9	Per L-9	Investigate and recalibrate, if necessary, per L-9	Accuracy/Bias	Per L-9
Labeled Compound Spike	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to protocol in L-9.	Accuracy/Bias	Per L-9
Labeled Internal Standards	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to protocol in L-9.	Accuracy/Bias	Per L-9

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Chlorinated Herbicides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-10, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<35	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<35
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	60-140
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	1 per sample	DCAA	50-120	The laboratories should evaluate potential corrective actions and implement, as appropriate. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	DCAA	50-120

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	Chlorinated Herbicides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/ SOP Reference	L-10, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**% Recovery**			**Compound**	**% Recovery**
Laboratory Control Sample	1 per extraction batch[a]	All target analytes	70-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	70-130
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	DOC/TOC
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-12
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	1 per analytical batch [a]	RPD ≤35%	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD ≤35%
Matrix Spike	1 per analytical batch [a]	% Recovery 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 50-150
Laboratory Control Sample	1 per analytical batch [a]	% Recovery 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 50-150

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group	DOC/TOC
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-12
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per analytical batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Instrument Blanks	1 per 10 determinations	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected field samples. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	TEPH
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-13
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	#2 Diesel	70-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	#2 Diesel	70-130
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	2 per sample	Chlorobenzene Ortho-terphenyl	60-120 60-120	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Chlorobenzene Ortho-terphenyl	60-120 60-120

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	TEPH
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-13
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acce ptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Matrix Spike Duplicate	1 per extraction batch [a]	RPD <50%		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD <50%	
Laboratory Control Sample	1 per extraction batch [a]	**Compound** #2 Diesel	**% Recovery** 70-120	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples . If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	**Compound** #2 Diesel	**% Recovery** 70-120
Method Blanks	1 per extraction batch [a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sampl e is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/ Whole Water
Analytical Group	Grain Size (HSM dissolved not analyzed for grain size)
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-14
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1a and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	1 per analytical batch [a]	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. Qualify data as needed.	Precision-Lab	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	HSM Dissolved/Whole Water
Analytical Group	TSS and TDS
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-15, L-16
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1a, Worksheet #20-1c, and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	1 per analytical batch [a]	RPD ≤20%	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD ≤20%
Laboratory Control Sample	1 per analytical batch [a]	% Recovery 75-125	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 75-125
Method Blank	1 per analytical batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	No target compounds ≥PQL

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	Whole Water (HSM Dissolved not analyzed for Metals, Mercury , and Methylmercury)
Analytical Group	Metals, Mercury , and Methylmercury
Concentration Level	Low
Sampling SOP	SOP-5
Analytical Method/SOP Reference	L-4, L-5, L-6
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Brooks Rand Labs
No. of Samples Collected	See Worksheet #20-1a and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Analyte	% Recovery			Analyte	% Recovery
Matrix Spike	1 per digestion/distillation batch [a]	Aluminum	75-125	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aluminum	75-125
		Antimony	79-122			Antimony	79-122
		Cadmium	84-113			Cadmium	84-113
		Copper	51-145			Copper	51-145
		Lead	72-143			Lead	72-143
		Mercury	71-125			Mercury	71-125
		Methyl Mercury	65-135			Methyl Mercury	65-135
		Nickel	68-134			Nickel	68-134
		Selenium	59-149			Selenium	59-149
		Silver	74-119			Silver	74-119
		Thallium	64-137			Thallium	64-137
		Zinc	46-146			Zinc	46-146
Initial Precision and Recovery	At initial setup or when corrective action is taken, which may change calibration per L-4, L-5, L-6	Per L-4, L-5, L-6		The laboratory should review their protocols and correct any that may have caused exceedance of the QC acceptance limits.	Accuracy/Bias	Per L-4, L-5, L-6	
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-4, L-5, L-6	Per L-4, L-5, L-6		The laboratory must follow all corrective actions required by L-4, L-5, L-6.	Accuracy/Bias	Per L-4, L-5, L-6	
Calibration Verification	Per L-4, L-5, L-6	Per L-4, L-5, L-6		Investigation and recalibrate, if necessary, per L-4, L-5, and L-6.	Accuracy/Bias	Per L-4, L-5, L-6	

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	Whole Water (HSM Dissolved not analyzed for Metals, Mercury , and Methylmercury)
Analytical Group	Metals, Mercury , and Methylmercury
Concentration Level	Low
Sampling SOP	SOP-5
Analytical Method/SOP Reference	L-4, L-5, L-6
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Brooks Rand Labs
No. of Sample s Collected	See Worksheet #20-1a and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Analyte	**% Recovery**			**Analyte**	**% Recovery**
Ongoing Precision and Recovery	1 per digestion/distillation batch [a]	Antimony	79-122	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Antimony	79-122
		Cadmium	84-113			Cadmium	84-113
		Copper	51-145			Copper	51-145
		Lead	72-143			Lead	72-143
		Mercury	77-123			Mercury	77-123
		Methyl Mercury	67-133			Methyl Mercury	67-133
		Nickel	68-134			Nickel	68-134
		Selenium	59-149			Selenium	59-149
		Silver	74-119			Silver	74-119
		Thallium	64-137			Thallium	64-137
		Zinc	46-146			Zinc	46-146
Method Blanks	1 per digestion/distillation batch [a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Matrix	Whole Water (HSM Dissolved not analyzed for Metals, Mercury , and Methylmercury)
Analytical Group	Metals, Mercury , and Methylmercury
Concentration Level	Low
Sampling SOP	SOP-5
Analytical Method/SOP Reference	L-4, L-5, L-6
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Brooks Rand Labs
No. of Sample s Collected	See Worksheet #20-1a and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Analyte	**RPD**			**Analyte**	**RPD**
Matrix Spike Duplicate	1 per digestion batch [b]	Metals Mercury Methyl Mercury	<20 <24 <35	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision - Lab	Metals Mercury Methyl Mercury	<20 <24 <35
Instrument Blanks	Per analytical method	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample digestates. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2c for footnotes.

QAPP Worksheet #28-2c
HSM Dissolved/Whole Water Laboratory Quality Control Samples (Continued)

Notes:

[a] A batch is defined as a group of up to 20 samples of the same matrix, prepared at the same time, using the same procedure.
[b] Per data validation SOP (USEPA Region 2 SOP HW-35, Revision 1) during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%

DCAA = 2,4-Dichlorophenylacetic acid
DOC = dissolved organic carbon
HSM = high-solids mass
OPR = ongoing precision and recovery
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SOP = Standard Operating Procedure
SIM = selective ion monitoring
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TSS = total suspended solids
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples

Matrix	LSM Particulate
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	Phenol	<35			Phenol	<35
		2-Chlorophenol	<50			2-Chlorophenol	<50
		N-Nitros o-di-n-propylamine	<38			N-Nitroso -di-n-propylamine	<38
		4-Chloro-3-methylphenol	<33			4-Chloro-3-methylphenol	<33
		Acenaphthene	<19			Acenaphthene	<19
		4-Nitrophenol	<50			4-Nitrophenol	<50
		2,4-Dinitrotoluene	<47			2,4-Dinitrotoluene	<47
		Pentachlorophenol	<47			Pentachlorophenol	<47
		Pyrene	<36			Pyrene	<36
		Compound	**% Recovery**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/ Bias	**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	Phenol	26-90			Phenol	26-90
		2-Chlorophenol	25-102			2-Chlorophenol	25-102
		N-Nitroso -di-n-propylamine	41-126			N-Nitroso -di-n-propylamine	41-126
		4-Chloro-3-methylphenol	26-103			4-Chloro-3-methylphenol	26-103
		Acenaphthene	31-137			Acenaphthene	31-137
		4-Nitrophenol	11-114			4-Nitrophenol	11-114
		2,4-Dinitrotoluene	28-89			2,4-Dinitrophenol	28-89
		Pentachlorophenol	17-109			Pentachlorophenol	17-109
		Pyrene	35-142			Pyrene	35-142

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery [b]**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.		**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	16 per sample	Phenol-d_5	17-103		Accuracy/ Bias	Phenol-d_5	17-103
		Bis(2-chloroethyl)ether-d_8	12-98			Bis(2-chloroethyl)ether-d_8	12-98
		2-Chlorophenol-d_4	13-101			2-Chlorophenol-d_4	13-101
		4-Methylphenol-d_8	8-100			4-Methylphenol-d_8	8-100
		Nitrobenzene -d_5	16-103			Nitrobenzene -d_5	16-103
		2-Nitrophenol -d_4	16-104			2-Nitrophenol -d_4	16-104
		2,4-Dichlorophenol-d_3	23-104			2,4-Dichlorophenol-d_3	23-104
		4-Chloroaniline-d_4	1-145			4-Chloroaniline-d_4	1-145
		Dimethylphthalate-d_6	43-111			Dimethylphthalate-d_6	43-111
		Acenaphthylene-d_8	20-97			Acenaphthylene-d_8	20-97
		4-Nitrophenol -d_4	16-166			4-Nitrophenol -d_4	16-166
		Fluorene-d_{10}	40-108			Fluorene-d_{10}	40-108
		4,6-Dinitro -2-methylphenol-d_2	1-121			4,6-Dinitro -2-methylphenol-d_2	1-121
		Anthracene-d_{10}	22-98			Anthracene-d_{10}	22-98
		Pyrene -d_{10}	50-120			Pyrene -d_{10}	50-120
		Benzo(a)pyrene-d_{12}	43-111			Benzo(a)pyrene-d_{12}	43-111

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	<15 <20	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision- Lab	Aroclor -1016 Aroclor -1260	<15 <20
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	Aroclor -1016 Aroclor-1260	29-135 29-135	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aroclor -1016 Aroclor -1260	29-135 29-135
		Surrogate Compound	**% Recovery**			**Surrogate Compound**	**% Recovery**
Surrogate Spikes	2 per sample	Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurem ent Performance Criteria	
		Compound	**% Recovery**			**Compound**	**% Recovery**
Laboratory Control Sample	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	50-150 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aroclor -1016 Aroclor -1260	50-150 50-150
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	
Instrument Blanks	1 per 12 hour sequence	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<25	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<25
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	50-150

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP -4
Analytical Method/SOP Referen ce	L-2, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision Recovery	1 per extraction batch[a]	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify dat a as needed.	Accuracy/Bias	All target compound concentrations must fall within the acceptance criteria provided in Table 5 of L-2
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contaminati on	No target compounds ≥PQL
Instrument Blanks	1 per 12 hour sequence	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-2	Per L-2	Investigate and recalibrate, if necessary, per L-2	Accuracy/Bias	Per L-2
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12-hour period per L-2	Per L-2	Investigate and recalibrate, if necessary, per L-2	Accuracy/Bias	Per L-2
Labeled Compound Spike	1 per sample	Per L-2	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2
Labeled Internal Standard	1 per sample	Per L-2	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples

Matrix	LSM Particulate
Analytical Group	Semivolatile Organics (SIM)
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extrac tion batch[a]	All target analytes	<40	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samp les. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<40
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify dat a as needed.	Accuracy/ Bias	All target analytes	60-140

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Semivolatile Organics (SIM)
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	5 per sample	Acenaphthene- d_{10} Chrysene-d_{12} Napthalene-d_8 Perylene-d_{12} Phenanthrene -d_{12}	20-130 20-130 20-130 20-130 20-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/ Bias	Acenaphthene- d_{10} Chrysene-d_{12} Napthalene-d_8 Perylene-d_{12} Phenanthrene -d_{12}	20-130 20-130 20-130 20-130 20-130
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<50	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<50
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	60-140

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch[a]	All target compound concentrations must fall within range provided in Table 6 of L-8.	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound concentrations must fall within range provided in Table 6 of L-8.
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12 hour period per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8
Labeled Compound Spike	1 per sample	Per L-8	The laboratory must follow all corrective actions required by L-8	Accuracy/Bias	Per L-8
Labeled Internal Standard	1 per sample	Per L-8	The laboratory must follow all corrective actions required by L-8	Accuracy/Bias	Per L-8

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	per extraction batch[a]	86 target analytes	<50	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	86 target analytes	<50
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration.	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration.	60-140

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch[a]	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of L-9
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-9	Per L-9	Investigate and recalibrate, if necessary, per L-9	Accuracy/Bias	Per L-9
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12 hour period per L-9	Per L-9	Investigate and recalibrate, if necessary, per L-9	Accuracy/Bias	Per L-9
Labeled Compound Spike	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to protocol in L-9.	Accuracy/Bias	Per L-9
Labeled Internal Standards	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to protocol in L-9.	Accuracy/Bias	Per L-9

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Chlorinated Herbicides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-10, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<35	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sampl e is available, re-analyze extracts. Qualify data as needed.	Precision- Lab	All target analytes	<35
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bi as	All target analytes	60-140
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	1 per sample	DCAA	50-120	The laboratories should evaluate potential corrective actions and implement, as appropriate. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	DCAA	50-120

See the last page of Worksheet #28-2d for footnotes .

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	Chlorinated Herbicides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-10, L-23, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**% Recovery**			**Compound**	**% Recovery**
Laboratory Control Sample	1 per extraction batch[a]	All target analytes	70-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	70-130
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sampl e is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	POC
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-11, L-22
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	1 per analytical batch[a]	RPD ≤35%	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD ≤35%
Matrix Spike	1 per analytical batch[a]	% Recovery 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 50-150

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Matrix	LSM Particulate
Analytical Group	POC
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-11, L-22
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1d and Worksheet #20-2b

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample	1 per analytical batch [a]	% Recovery 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 50-150
Method Blanks	1 per analytical batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Instrument Blanks	1 per 10 determinations	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected field samples. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2d for footnotes.

QAPP Worksheet #28-2d
LSM Particulate Laboratory Quality Control Samples (Continued)

Notes:

[a] A batch is defined as a group of up to 20 samples of the same matrix, prepared at the same time, using the same procedure.
[b] Per data validation SOP (USEPA Region 2 SOP HW-35, Revision 1), during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%.

DCAA = 2,4-Dicholorphenylacetic acid
LSM = low-solids mass
OPR = ongoing precision and recovery
PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SOP = Standard Operating Procedure
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
POC = particulate organic carbon
SIM = selective ion monitoring
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples

Matrix	LSM Dissolved
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-17, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	Phenol	<42	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	Phenol	<42
		2-Chlorophenol	<40			2-Chlorophenol	<40
		N-Nitroso -di-n-propylamine	<38			N-Nitroso -di-n-propylamine	<38
		4-Chloro-3-methylphenol	<42			4-Chloro-3-methylphenol	<42
		Acenaphthene	<31			Acenaphthene	<31
		4-Nitrophenol	<50			4-Nitrophenol	<50
		2,4-Dinitrotoluene	<38			2,4-Dinitrotoluene	<38
		Pentachlorophenol	<50			Pentachlorophenol	<50
		Pyrene	<31			Pyrene	<31
		Compound	**% Recovery**	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	Phenol	12-110			Phenol	12-110
		2-Chlorophenol	27-123			2-Chlorophenol	27-123
		N-Nitroso -di-n-propylamine	41-116			N-Nitroso -di-n-propylamine	41-116
		4-Chloro-3-methylphenol	23-97			4-Chloro-3-methylphenol	23-97
		Acenaphthene	46-118			Acenaphthene	46-118
		4-Nitrophenol	10-80			4-Nitrophenol	10-80
		2,4-Dinitrotoluene	24-96			2,4-Dinitrophenol	24-96
		Pentachlorophenol	9-103			Pentachlorophenol	9-103
		Pyrene	26-127			Pyrene	26-127

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-17, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery [b]**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	16 per sample	Phenol-d_5	39-106	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Phenol-d_5	39-106
		Bis(2-chloroethyl)ether -d_8	40-105			Bis(2-chloroethyl)ether-d_8	40-105
		2-Chlorophenol-d_4	41-106			2-Chlorophenol-d_4	41-106
		4-Methylphenol-d_8	25-111			4-Methylphenol-d_8	25-111
		Nitrobenzene -d_5	43-108			Nitrobenzene -d_5	43-108
		2-Nitrophenol -d_4	40-108			2-Nitrophenol -d_4	40-108
		2,4-Dichlorophenol-d_3	37-105			2,4-Dichlorophenol-d_3	37-105
		4-Chloroaniline-d_4	1-145			4-Chloroaniline-d_4	1-145
		Dimethylphthalate-d_6	47-114			Dimethylphthalate-d_6	47-114
		Acenaphthylene-d_8	41-107			Acenaphthylene-d_8	41-107
		4-Nitrophenol -d_4	33-116			4-Nitrophenol -d_4	33-116
		Fluorene-d_{10}	42-111			Fluorene-d_{10}	42-111
		4,6-Dinitro -2-methylphenol-d_2	22-104			4,6-Dinitro -2-methylphenol-d_2	22-104
		Anthracene-d_{10}	44-110			Anthracene-d_{10}	44-110
		Pyrene -d_{10}	52-119			Pyrene -d_{10}	52-119
		Benzo (a)pyrene-d_{12}	32-121			Benzo(a)pyrene-d_{12}	32-121

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Semivolatile Organics
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-17, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per extraction batch[a]	No target compounds ≥ PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/ SOP Reference	L-1, L-24, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	<15 <20	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	Aroclor -1016 Aroclor -1260	<15 <20
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	29-135 29-135	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insuff icient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aroclor -1016 Aroclor -1260	29-135 29-135
		Surrogate Compound	**% Recovery**			**Surrogate Compound**	**% Recovery**
Surrogate Spikes	2 per sample	Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Tetrachloro -m-xylene Decachlorobiphenyl	30-150 30-150

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Aroclor PCBs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-24, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**% Recovery**			**Compound**	**% Recovery**
Laboratory Control Sample	1 per extraction batch[a]	Aroclor -1016 Aroclor -1260	50-150 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aroclor -1016 Aroclor -1260	50-150 50-150
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	
Instrument Blanks	1 per 12 hour sequence	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-19, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	RPD			Compound	RPD
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<25	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All taraget analytes	<25
		Compound	% Recovery			Compound	% Recovery
Matrix Spike	1 per extraction batch[a]	All target analytes	50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	50-150

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP -4
Analytical Method/SOP Reference	L-2, L-19, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Sample s Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch [a]	All target compound concentrations must be within the acceptable criteria provided in Table 5 of L-2	The labora tories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts . Qualify data as needed.	Accuracy/Bias	All target compound concentrations must be within the acceptable criteria provided in Table 5 of L-2
Instrument Blanks	1 per 12 hour sequence	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample extracts. Qualify data as needed. Accuracy/Bias Contamination	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-19, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-2	Per L-2	Investigate and recalibrate, if necessary, per L-2	Accuracy/Bias	Per L-2

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Organochlorine Pesticides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-2, L-19, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12-hour period per L-2	Per L-2	Investigate and recalibrate, if necessary, per L-2	Accuracy/Bias	Per L-2
Labeled Compound Spike	1 per sample	Per L-2	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2
Labeled Internal Standard	1 per sample	Per L-2	The laboratory should review their protocols and correct any that may have caused exceedance of QC acceptance limits. The laboratory must follow all corrective actions required by L-2	Accuracy/Bias	Per L-2

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Semivolatile Organics (SIM)
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-18, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<40	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<40
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	60-140

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Semivolatile Organics (SIM)
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-1, L-18, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	5 per sample	Naphthalenel-d_8 Acenaphthene- d_{10} Phenanthrene-d_{10} Chrysene -d_{12} Perylene-d_{12}	20-130 20-130 20-130 20-130 20-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Naphthalenel-d_8 Acenaphthene- d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene-d_{12}	20-130 20-130 20-130 20-130 20-130
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8, L-20, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<50	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<50
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	60-140

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8, L-20, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch [a]	All target compound concentrations must fall within range provided in Table 6 of L-8	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound concentrations must fall within range provided in Table 6 of L-8
Method Blanks	1 per extraction batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	PCDD/PCDFs
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-8, L-20, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12 hour period per L-8	Per L-8	Investigate and recalibrate, if necessary, per L-8	Accuracy/Bias	Per L-8
Labeled Compound Spike	1 per sample	Per L-8	The laboratory should review their protocols and corrective any that may have caused exceedance of QC acceptance limits refer to L-8	Accuracy/Bias	Per L-8
Labeled Internal Standard	1 per sample	Per L-8	The laboratory should review their protocols and corrective any that may have caused exceedance of QC acceptance limits refer to L-8	Accuracy/Bias	Per L-8

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9, L-21, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	86 target analytes	<50	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	86 target analytes	<50
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration.	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	86 target analytes Note: Spike recoveries are evaluated only when the spike level is in the range of 25-400% of the reported concentration.	60-140

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9, L-21, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ongoing Precision and Recovery	1 per extraction batch[a]	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of USEPA 1668A.	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target compound analytes contained in the OPR must have observed concentration values that fall within the acceptance ranges provided in Table 6 of USEPA 1668A.
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	PCB Congeners
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-9, L-21, L-24
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Vista Analytical
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	At initial setup or when corrective action is taken, which may change calibration per L-9	Per L-9	Investigate and recalibrate, if necessary, per L-9	Accuracy/Bias	Per L-9
Calibration Verification	Prior to every 12-hour period, but following Column Performance Solution and at end of 12 hour period per L-9	Per L-9	Investigate and recalibrate, if necessary, per L-9	Accuracy/Bias	Per L-9
Labeled Compound Spike	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to protocol in L-9.	Accuracy/Bias	Per L-9
Labeled Internal Standards	1 per sample	Per L-9	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Refer to protocol in L-9.	Accuracy/Bias	Per L-9

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Chlorinated Herbicides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-10, L-24, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	**RPD**			**Compound**	**RPD**
Matrix Spike Duplicate	1 per extraction batch[a]	All target analytes	<35	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	All target analytes	<35
		Compound	**% Recovery**			**Compound**	**% Recovery**
Matrix Spike	1 per extraction batch[a]	All target analytes	60-140	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	60-140
		Surrogate Compounds	**% Recovery**			**Surrogate Compounds**	**% Recovery**
Surrogate Spikes	1 per sample	DCAA	50-120	The laboratories should evaluate potential corrective actions and implement, as appropriate. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	DCAA	50-120

See the last page of Worksheet #28-2e for footnotes .

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	Chlorinated Herbicides
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/ SOP Reference	L-10, L-24, L-25
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Compound	% Recovery			Compound	% Recovery
Laboratory Control Sample	1 per extraction batch[a]	All target analytes	70-130	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	All target analytes	70-130
Method Blanks	1 per extraction batch[a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	DOC
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-12, L-22
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	1 per analytical batch[a]	RPD ≤35%	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD ≤35%
Matrix Spike	1 per analytical batch[a]	% Recovery 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 50-150
Laboratory Control Sample	1 per analytical batch[a]	% Recovery 50-150	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 50-150

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	DOC
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-12, L-22
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Sample s Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blanks	1 per analytical batch [a]	No target compounds ≥PQL	The laboratories should review their proto cols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contami nation	No target compounds ≥PQL
Instrument Blanks	1 per 10 determinations	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected field samples. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Matrix	LSM Dissolved
Analytical Group	TSS & TDS
Concentration Level	Low
Sampling SOP	SOP-3, SOP-4
Analytical Method/SOP Reference	L-15, L-16
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1e and Worksheet #20-2a

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	1 per analytical batch [a]	RPD ≤20%	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD ≤20%
Laboratory Control Sample	1 per analytical batch [a]	% Recovery 75-125	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 75-125
Method Blank	1 per analytical batch [2]	No target compound ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	No target compound ≥PQL

See the last page of Worksheet #28-2e for footnotes.

QAPP Worksheet #28-2e
LSM Dissolved Laboratory Quality Control Samples (Continued)

Notes:

[a] A batch is defined as a group of up to 20 samples of the same matrix, prepared at the same time, using the same procedure.
[b] Per data validation SOP (USEPA Region 2 SOP HW-35, Revision 1), during the semivolatile organic validation process, all data will be rejected when the surrogate recovery is below 10%.

DCAA = 2,4-Dichlorophenylacetic acid
DOC = dissolved organic carbon
LSM = low-solids mass
OPR = ongoing precision and recovery
PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SOP = Standard Operating Procedure
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
SIM = selective ion monitoring
TDS = total dissolved solids
TSS = total suspended solids
USEPA = U.S. Environmental Protection Agency
% = percent

QAPP Worksheet #28-2f
Grab Sample Laboratory Quality Control Samples

Matrix	Grab Sample Whole Water and Grab Sample Dissolved
Analytical Group	Metals, Mercury, and Methyl mercury
Concentration Level	Low
Sampling SOP	SOP-5
Analytical Method/SOP Reference	L-4, L-5, L-6
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Brooks Rand Labs
No. of Sample s Collected	See Worksheet #20-1f and Worksheet #20-2c

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Analyte	**% Recovery**			**Analyte**	**% Recovery**
Matrix Spike	1 per digestion/distillation batch [a]	Aluminum	75-125	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Aluminum	75-125
		Antimony	79-122			Antimony	79-122
		Cadmium	84-113			Cadmium	84-113
		Copper	51-145			Copper	51-145
		Lead	72-143			Lead	72-143
		Mercury	71-125			Mercury	71-125
		Methyl Mercury	65-135			Methyl Mercury	65-135
		Nickel	68-134			Nickel	68-134
		Selenium	59-149			Selenium	59-149
		Silver	74-119			Silver	74-119
		Thallium	64-137			Thallium	64-137
		Zinc	46-146			Zinc	46-146
Laboratory Duplicate	1 per digestion/distillation batch [a]	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples.		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD ≤20% when target is detected in both field duplicate samples at >5X PQL, or concentrations differ by less than 2X the PQL when detects are <5X PQL for both field duplicate samples.	

See the last page of Worksheet #28-2f for footnotes.

QAPP Worksheet #28-2f
Grab Sample Laboratory Quality Control Samples (Continued)

Matrix	Grab Sample Whole Water and Grab Sample Dissolved
Analytical Group	Metals, Mercury, and Methyl mercury
Concentration Level	Low
Sampling SOP	SOP-5
Analytical Method/SOP Reference	L-4, L-5, L-6
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Brooks Rand Labs
No. of Samples Collected	See Worksheet #20-1f and Worksheet #20-2c

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Analyte	**% Recovery**			**Analyte**	**% Recovery**
Ongoing Precision and Recovery	1 per digestion/distillation batch [a]	Antimony	79-122	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	Antimony	79-122
		Cadmium	84-113			Cadmium	84-113
		Copper	51-145			Copper	51-145
		Lead	72-143			Lead	72-143
		Mercury	77-123			Mercury	77-123
		Methyl Mercury	67-133			Methyl Mercury	67-133
		Nickel	68-134			Nickel	68-134
		Selenium	59-149			Selenium	59-149
		Silver	74-119			Silver	74-119
		Thallium	64-137			Thallium	64-137
		Zinc	46-146			Zinc	46-146
Method Blanks	1 per digestion/distillation batch [a]	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	

See the last page of Worksheet #28-2f for footnotes.

QAPP Worksheet #28-2f
Grab Sample Laboratory Quality Control Samples (Continued)

Matrix	Grab Sample Whole Water and Grab Sample Dissolved
Analytical Group	Metals, Mercury, and Methyl mercury
Concentration Level	Low
Sampling SOP	SOP-5
Analytical Method/SOP Reference	L-4, L-5, L-6
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	Brooks Rand Labs
No. of Samples Collected	See Worksheet #20-1f and Worksheet #20-2c

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
		Analyte	**RPD**			**Analyte**	**RPD**
Matrix Spike Duplicate	1 per digestion batch [b]	Metals Mercury Methyl Mercury	<20 <24 <35	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-digest/re-distill and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	Metals Mercury Methyl Mercury	<20 <24 <35
Instrument Blanks	Per analytical method	No target compounds ≥PQL		The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. Re-analyze affected sample digestates. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL	
Initial Precision and Recovery	At initial setup or when corrective action is taken, which may change calidbration per L-4, L-5, L-6	Per L-4, L-5, and L-6		The laboriatories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits.	Accuracy/Bias	Per L-4, L-5, and L-6	
Initial Calibration	At initial setup or when corrective action is taken, which may change calidbration per L-4, L-5, L-6	Per L-4, L-5, and L-6		The laboriatory must follow all corrective actions required by L-4, L-5, and L-6.	Accuracy/Bias	Per L-4, L-5, and L-6	
Calibration Verification	Per L-4, L-5, L-6	Per L-4, L-5, and L-6		Investigate and recalibrate, if necessary, per L-4, L-5, and L-6.	Accuracy/Bias	Per L-4, L-5, and L-6	

See the last page of Worksheet #28-2f for footnotes.

QAPP Worksheet #28-2f
Grab Sample Laboratory Quality Control Samples (Continued)

Notes:

[a] A batch is defined as a group of up to 20 samples of the same matrix, prepared at the same time, using the same procedure.

PQL = project quantitation limit
QC = quality control
RPD = relative percent difference
SOP = Standard Operating Procedure
% = percent

QAPP Worksheet #28-2g
Grab Sample Whole Water Laboratory Quality Control Samples

Matrix	Grab Sample Whole Water
Analytical Group	TSS and TDS
Concentration Level	Low
Sampling SOP	SOP-3
Analytical Method/SOP Reference	L-15, L-16
Field Sampling Organization	ARCADIS U.S., Inc.
Analytical Organization	TestAmerica, Burlington, VT
No. of Samples Collected	See Worksheet #20-1g and Worksheet #20-2d

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	1 per analytical batch [a]	RPD ≤20%	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Precision-Lab	RPD ≤20%
Laboratory Control Sample	1 per analytical batch [a]	% Recovery 75-125	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias	% Recovery 75-125
Method Blanks	1 per analytical batch [a]	No target compounds ≥PQL	The laboratories should review their protocols and correct any that may have caused exceedance of the QC acceptance limits. If sufficient field sample is available, re-extract and re-analyze affected samples. If insufficient sample is available, re-analyze extracts. Qualify data as needed.	Accuracy/Bias Contamination	No target compounds ≥PQL

Notes:
[a] A batch is defined as a group of up to 20 samples of the same matrix, prepared at the same time, using the same procedure.

QC = quality control
RPD = relative percent difference
SOP = Standard Operating Procedure
TDS = total dissolved solids
TSS = total suspended solids
% = percent

QAPP Worksheet #30
Analytical Services

Matrix: All
Concentration: Low

Analytical Group	Sample Locations/ID Numbers	Analytical SOP[a,b]	Data Package[c] Turnaround Time	Laboratory/Organization	Backup Laboratory/Organization
Semivolatile Organics	As specified in Worksheets #18-1 and #18-2	L-1, L-17, L-23, L-24	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
Volatile Organics[d]	As specified in Worksheets #18-1 and #18-2	L-1	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
Aroclor PCBs	As specified in Worksheets #18-1 and #18-2	L-1, L-23, L-24, L-25	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
Organochlorine Pesticides	As specified in Worksheets #18-1 and #18-2	L-2, L-19, L-23, L-24, L-26	40 days	Martha Maier Vista Analytical 1104 Windfield Way El Dorado Hills, CA 95762 1-916-673-1520	NA
Semivolatile Organics (SIM)	As specified in Worksheets #18-1 and #18-2	L-1, L-18, L-23, L-24	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
Metals	As specified in Worksheets #18-1 and #18-2	L-4	40 days	Tiffany Stilwater Brooks Rand Labs 3958 6th Ave NW Seattle, WA 98107 1-206-632-6206	NA
Mercury	As specified in Worksheets #18-1 and #18-2	L-5	40 days	Tiffany Stilwater Brooks Rand Labs 3958 6th Ave NW Seattle, WA 98107 1-206-632-6206	NA
Methylmercury	As specified in Worksheets #18-1 and #18-2	L-6	40 days	Tiffany Stilwater Brooks Rand Labs 3958 6th Ave NW Seattle, WA 98107 1-206-632-6206	NA

See the last page of Worksheet #30 for a description of footnotes.

QAPP Worksheet #30
Analytical Services (continued)

Matrix: All
Concentration: Low

Analytical Group	Sample Locations/ID Numbers	Analytical SOP[a,b]	Data Package[c] Turnaround Time	Laboratory/Organization	Backup Laboratory/Organization
Cyanide	As specified in Worksheets #18-1 and #18-2	L-7	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
PCDD/PCDFs	As specified in Worksheets #18-1 and #18-2	L-8, L-20, L-23, L-24	40 days	Martha Maier Vista Analytical 1104 Windfield Way El Dorado Hills, CA 95762 1-916-673-1520	NA
PCB Congeners	As specified in Worksheets #18-1 and #18-2	L-9, L-21, L-23, L-24	40 days	Martha Maier Vista Analytical 1104 Windfield Way El Dorado Hills, CA 95762 1-916-673-1520	NA
Chlorinated Herbicides	As specified in Worksheets #18-1 and #18-2	L-10, L-23, L-24, L-25	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
POC	As specified in Worksheets #18-1 and #18-2	L-11, L-22	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
TOC	As specified in Worksheets #18-1 and #18-2	L-11, L-12	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
DOC	As specified in Worksheets #18-1 and #18-2	L-12	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
TEPH	As specified in Worksheets #18-1 and #18-2	L-13	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA

See the last page of Worksheet #30 for a description of footnotes.

QAPP Worksheet #30
Analytical Services (continued)

Matrix: All
Concentration: Low

Analytical Group	Sample Locations/ID Numbers	Analytical SOP[a,b]	Data Package[c] Turnaround Time	Laboratory/Organization	Backup Laboratory/Organization
Grain Size	As specified in Worksheets #18-1 and #18-2	L-14	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
TSS	As specified in Worksheets #18-1 and #18-2	L-15	40 days	Kirk Young TestAmerica 30 Community Drive, Suite 11 South Burlington, VT 05403 1-802-923-1017	NA
TDS	As specified in Worksheets #18-1 and #18-2	L-16	40 days	Kirk Young TestAmerica South Burlington, VT 05403 1-802-923-1017	NA

Notes:

[a] LSM bulk sample filtration (SOP L-24) will occur at the TestAmerica, Burlington, VT laboratory.
[b] Where laboratory SOP L-24 is listed for an analytical group, the actual LSM sample separation procedure (L-24) will be performed by TestAmerica, Burlington, VT only, regardless of the laboratory/organization listed for the analyses itself.
[c] Turnaround time based on day the last sample in the sample delivery group is received by laboratory.
[d] Volatile organics are analyzed at the trace level in HSM dissolved, whole water matrices.

DOC = dissolved organic carbon
HSM = high-solids mass
NA = not applicable
PCBs = polychlorinated biphenyls
PCDD/PCDFs = polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
POC = particulate organic carbon
SIM = selective ion monitoring
SOP = Standard Operating Procedure
TBD = to be determined
TDS = total dissolved solids
TEPH = total extractable petroleum hydrocarbons
TOC = total organic carbon
TSS = total suspended solids

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QAPP Worksheet #31
Planned Project Assessments

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organization Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Field Sampling Technical Systems Audit	1 audit of each program task	External	TBD[a], Auditor	TBD[a], Auditor	TBD[a] Field Supervisor ARCADIS U.S., Inc.	TBD[a] Field Supervisor ARCADIS U.S., Inc.	Alain Hebert Project Manager ARCADIS U.S., Inc.
Laboratory Technical Systems Audit	1 audit of each participating laboratory prior to use or again after a period of inactivity associated with Tierra exceeding 2 years	External	Environmental Data Services, Ltd.	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd	Laboratory Project Manager	Laboratory Project Manager	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd
Field Readiness Review	1 at sampling startup	Internal	ARCADIS U.S., Inc.	Meredith Hayes Task Manager ARCADIS U.S., Inc.	TBD[a] Field Supervisor ARCADIS U.S., Inc.	TBD[a] Field Supervisor ARCADIS U.S., Inc.	Alain Hebert Project Manager ARCADIS U.S., Inc.
Laboratory Readiness Review	1 at sampling startup	Internal	TestAmerica, Burlington, VT	Kirk Young Laboratory Project Manger TestAmerica, Burlington, VT	Various Personnel TestAmerica, Burlington, VT	Various Personnel TestAmerica, Burlington, VT	Kirk Young Laboratory Project Manger TestAmerica, Burlington, VT
Laboratory Readiness Review	1 at sampling startup	Internal	Brooks Rand Labs Seattle, WA	Tiffany Stilwater Laboratory Project Manager Brooks Rand Labs, Seattle, WA	Various Personnel Brooks Rand Labs, Seattle, WA	Various Personnel Brooks Rand Labs, Seattle, WA	Tiffany Stilwater Laboratory Project Manager Brooks Rand Labs, Seattle, WA
Laboratory Readiness Review	1 at sampling startup	Internal	Vista Analytical El Dorado Hills, CA	Martha Maier Laboratoray Project Manager Vista Analyical, El Dorado Hills, CA	Various Personnel Vista Analytical El Dorado Hills, CA	Various Personnel Vista Analytical El Dorado Hills, CA	Martha Maier Laboratoray Project Manager Vista Analyical, El Dorado Hills, CA

See the last page of Worksheet #31 for of footnotes.

QAPP Worksheet #31
Planned Project Assessments (Continued)

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organization Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Internal Field Audits	2 during field operations	Internal	ARCADIS U.S., Inc.	TBD[a] ARCADIS U.S., Inc.	TBD[a] Field Supervisor ARCADIS U.S., Inc.	TBD[a] Field Supervisor ARCADIS U.S., Inc.	Alain Hebert Project Manager ARCADIS U.S., Inc.
Internal Laboratory Audit	1 audit prior to use	Internal	TestAmerica, Burlington, VT	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	Various Personnel from TestAmerica, Burlington, VT	Various Personnel from TestAmerica Burlington, VT	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.
Internal Laboratory Audit	1 audit prior to use	Internal	Vista Analytical, El Dorado Hills, CA	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	Various Personnel from Vista Analytical, El Dorado Hills, CA	Various Personnel from Vista Analytical El Dorado Hills, CA	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.
Internal Laboratory Audit	1 audit prior to use	Internal	Brooks Rand Labs, Seattle, WA	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	Various Personnel from Brooks Rand Labs, Seattle, WA	Various Personnel from Brooks Rand Labs, Seattle, WA	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.
Data Validation	All analytical data collected is validated[b]	External	Environmental Data Services, Ltd.	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	Field and Laboratory Contractors	Field and Laboratory Contractors	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.

Notes:

[a] ARCADIS will provide the TBD information for the Field Supervisor prior to the start of the project.
[b] All data collected will undergo full data validation (with the exception of grain size) as outlined in Worksheet #36. Grain size data collected will be verified per Standard Operating Procedure.

TBD = to be determined

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, and Organization)	Timeframe for Response
Field Readiness Review	Meeting and memo	TBD[a] Field Supervisor ARCADIS U.S., Inc.	24 hours after review complete	Memo	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2	Immediate
Laboratory Readiness Review	Meeting and memo	Kirk Young Laboratory Project Manger TestAmerica, Burlington, VT	24 hours after review complete	Memo	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2	Immediate
Laboratory Readiness Review	Meeting and memo	Martha Maier Laboratory Project Manager Vista Analytical	24 hours after review complete	Memo	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2	Immediate
Laboratory Readiness Review	Meeting and memo	Tiffany Stilwater Laboratory Project Manager Brooks Rand Labs, Seattle, WA	24 hours after review complete	Memo	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2	Immediate
Internal Field Audit	Audit Report	TBD[a] Field Supervisor ARCADIS U.S., Inc.	1 week after audit is complete	Memo	Alain Hebert Project Manager ARCADIS U.S., Inc.	1 week
Internal Laboratory Audit	Audit Report	Kirk Young Laboratory Project Manager TestAmerica, Burlington, VT	As required by laboratory QMP	Memo or as required by laboratory QMP	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	As required by laboratory QMP

See the last page of Worksheet #32 for footnotes.

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses (Continued)

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Time frame of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, and Organization)	Time frame for Response
Internal Laboratory Audit	Audit Report	Martha Maier Laboratory Project Manager Vista Analytical, El Dorado Hills, CA	As required by laboratory QMP	Memo or as required by laboratory QMP	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	As required by laboratory QMP
Internal Laboratory Audit	Audit Report	Tiffany Stilwater Laboratory Project Manager Brooks Rand Labs, Seattle, WA	As required by laboratory QMP	Memo or as required by laboratory QMP	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	As required by laboratory QMP
Data Validation [b]	Validation Reports	All of those listed above as impacted	40 days after receipt of laboratory and field deliverables	Resubmission of missing or corrected documents	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc., Alice Yeh Remedial Project Manager USEPA Region 2	1 week after request for completion/correction
Field Sampling Technical Systems Audit	Audit Report/ Corrective Action Form	TBD [a] Field Supervisor ARCADIS U.S., Inc.,	1 week after audit is complete	Audit Report/ Corrective Action Form	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc., Alice Yeh Remedial Project Manager USEPA Region 2	Immediate
Laboratory Technical Systems Audit	Audit Report/ Corrective Action Form	Impacted Laboratory Project Manager	1 week after audit is complete	Audit Report/ Corrective Action Form	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc., Alice Yeh Remedial Project Manager USEPA Region 2	Immediate

Notes :

[a] ARCADIS will provide the TBD information for the Field Supervisor prior to the start of the project.
[b] All data collected will undergo full data validation (with the exception of grain size) as outlined in Worksheet #36. Grain size data collected will be verified per Standard Operating Procedure.

QMP = quality management plan
TBD = to be determined
USEPA = U.S. Environmental Protection Agency

QAPP Worksheet #33
QA Management Reports

Type of Report	Frequency (e.g., daily, weekly, monthly, quarterly, annually)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Field Sampling Technical Systems Audit Reports	1 per audit conducted	Within 30 days of audit completion	TBD[a] ARCADIS U.S., Inc.	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2
Laboratory Technical Systems Audit	1 per audit conducted	Within 30 days of audit completion	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2
Internal Field Audit Report	1 per audit conducted	Within 30 days of audit completion	TBD[a] ARCADIS U.S., Inc.	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2
Internal Laboratory Audit Report	1 per audit conducted	Within 30 days of audit completion	Kirk Young TestAmerica Burlington, VT	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2
Internal Laboratory Audit Report	1 per audit conducted	Within 30 days of audit completion	Martha Maier Vista Analytical El Dorado Hills, CA	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2
Internal Laboratory Audit Report	1 per audit conducted	Within 30 days of audit completion	Tiffany Stilwater Brooks Rand Labs Seattle, WA	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2

See the last page of Worksheet #33 for footnotes.

QAPP Worksheet #33
QA Management Reports (cont.)

Type of Report	Frequency (e.g., daily, weekly, monthly, quarterly, annually)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Standard Reference Material Performance Evaluation Report	1 prior to initiation of Phase I and II field sampling activities and periodically thereafter [b]	Prior to initiation of field sampling activities	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2
Data Validation Reports	1 per sample delivery group, per analytical group	Within 40 days of receipt of final deliverables in the sample delivery group	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh Remedial Project Manager USEPA Region 2
Data Usability Assessment Report	1 after completion of validation task Phase I and another after completion of validation task Phase II	Within 40 days of validation completion	Diane Waldschmidt Quality Assurance Coordinator Environmental Data Services, Ltd.	Paul J. Brzozowski Project Coordinator Tierra Solutions, Inc. Alice Yeh[c] Remedial Project Manager USEPA Region 2

Notes:

All data collected will undergo full data validation (with the exception of grain size) as outlined in Worksheet #36. Grain size data collected will be verified per standard operating procedure.

[a] ARCADIS will provide the TBD information prior to the start of the project.
[b] Project laboratory performance evaluation sample studies will be administered per the specifications outlined in Tierra's April 28, 2011 memorandum to USEPA (approved by USEPA via email on May 3, 2011.
[c] USEPA will receive, review, and approve the Data Usability Assessment Report.

TBD = to be determined
Tierra = Tierra Solutions, Inc.
USEPA = U.S. Environmental Protection Agency