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Item #	Line Item	Notes	Unit Price	Qty/Unit		Attch.	Docs
20-21-A--01-01	METALS: Cadmium	**Supplier Product Code: METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.25 ug/L	**First Offer -** $6.00	4 / each	**$24.00**	**Y**	**Y**
20-21-A--01-02	METALS: Chromium	**Supplier Product Code: METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.25 ug/L	**First Offer -** $6.00	4 / each	**$24.00**		**Y**
20-21-A--01-03	METALS: Copper	**Supplier Product Code: METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.75 ug/L	**First Offer -** $6.00	6 / each	**$36.00**		**Y**
20-21-A--01-04	METALS: Lead	**Supplier Product Code: METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.25 ug/L	**First Offer -** $6.00	104 / each	**$624.00**		**Y**
20-21-A--01-05	METALS: Mercury	**Supplier Product Code: METHOD**: 245.1 **METHOD DETECTION LIMIT**: 0.025 ug/L	**First Offer -** $15.00	4 / each	**$60.00**		**Y**
20-21-A--01-06	METALS:	**Supplier**	**First Offer -** $85.00	4 / each	**$340.00**		**Y**

	Mercury, Low Level	**Product Code:** **METHOD**: 1631 **METHOD DETECTION LIMIT**: 0.00014 ug/L				
20-21-A--01-07	METALS: Nickel	**Supplier Product Code:** **METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.25 ug/L	**First Offer -** $6.00	4 / each	**$24.00**	**Y**
20-21-A--01-08	METALS: Silver	**Supplier Product Code:** **METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.125 ug/L	**First Offer -** $6.00	6 / each	**$36.00**	**Y**
20-21-A--01-09	METALS: Zinc	**Supplier Product Code:** **METHOD**: 200.8 **METHOD DETECTION LIMIT**: 1.25 ug/L	**First Offer -** $6.00	4 / each	**$24.00**	**Y**
20-21-A--01-10	METALS: Tin	**Supplier Product Code:** **METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.25 ug/L	**First Offer -** $6.00	1 / each	**$6.00**	**Y**
20-21-A--01-11	METALS: Selenium	**Supplier Product Code:** **METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.25 ug/L	**First Offer -** $6.00	1 / each	**$6.00**	**Y**
20-21-A--01-12	METALS: Beryllium	**Supplier Product Code:**	**First Offer -** $6.00	1 / each	**$6.00**	**Y**

		METHOD: 200.8 **METHOD DETECTION LIMIT**: 0.125 ug/L					
20-21-A--01-13	METALS: Boron	**Supplier Product Code: METHOD**: 200.8 **METHOD DETECTION LIMIT**: 1.25 ug/L	**First Offer -** $6.00	1 / each	**$6.00**		**Y**
20-21-A--01-14	METALS: Barium	**Supplier Product Code: METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.25 ug/L	**First Offer -** $6.00	1 / each	**$6.00**		**Y**
20-21-A--01-15	METALS: Aluminum	**Supplier Product Code: METHOD**: 200.8 **METHOD DETECTION LIMIT**: 2.5 ug/L	**First Offer -** $6.00	2 / each	**$12.00**		**Y**
20-21-A--01-16	METALS: Chromium VI (Hexavalent)	**Supplier Product Code: METHOD**: SM 3500 **METHOD DETECTION LIMIT**: 3 ug/L	**First Offer -** $25.00	6 / each	**$150.00**		**Y**
				Lot Total	$1,384.00		

Item #	Line Item	Notes	Unit Price	Qty/Unit		Attch.	Docs
20-21-A--02-01	Miscellaneous: Arsenic	**Supplier Product Code: METHOD**: 200.8 **METHOD DETECTION LIMIT**: 0.25 ug/L	**First Offer -** $6.00	4 / each	**$24.00**		**Y**
20-21-A--02-02	Miscellaneous: Cyanide	**Supplier Product**	**First Offer -** $25.00	12 / each	**$300.00**		**Y**

		Code: **METHOD**: SM 4500 **METHOD DETECTION LIMIT**: 10 ug/L				
20-21-A--02-03	Miscellaneous: Cyanide, Available	**Supplier Product Code:** **METHOD**: SM 4500 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $25.00	4 / each	**$100.00**	**Y**
20-21-A--02-04	Miscellaneous: Fluoride	**Supplier Product Code:** **METHOD**: 300.0 **METHOD DETECTION LIMIT**: 100 ug/L	**First Offer -** $15.00	1 / each	**$15.00**	**Y**
20-21-A--02-05	Miscellaneous: Phosphates	**Supplier Product Code:** **METHOD**: SM 4500 **METHOD DETECTION LIMIT**: 0.01 mg/L	**First Offer -** $15.00	2 / each	**$30.00**	**Y**
20-21-A--02-06	Miscellaneous: Total Organic Carbon	**Supplier Product Code:** **METHOD**: SM 5310C **METHOD DETECTION LIMIT**: 0.5 mg/L	**First Offer -** $28.00	38 / each	**$1,064.00**	**Y**
20-21-A--02-07	Miscellaneous: Biochemical Oxygen Demand	**Supplier Product Code:** **METHOD**: SM 5210B **METHOD DETECTION LIMIT**: 2 mg/L	**First Offer -** $25.00	2 / each	**$50.00**	**Y**
20-21-A--02-08	Miscellaneous: Chemical Oxygen Demand	**Supplier Product Code:** **METHOD**: SM 5220D	**First Offer -** $20.00	2 / each	**$40.00**	**Y**

		METHOD DETECTION LIMIT: 20 mg/L				
20-21-A--02-09	Miscellaneous: Oil and Grease	**Supplier Product Code: METHOD**: 1664 **METHOD DETECTION LIMIT**: 2.6 mg/L	**First Offer -** $30.00	300 / each	**$9,000.00**	**Y**
20-21-A--02-10	Miscellaneous: Paint Filter Test (Pass/Fail)	**Supplier Product Code: METHOD**: SM 9095 **METHOD DETECTION LIMIT**: Pass/Fail	**First Offer -** $15.00	4 / each	**$60.00**	**Y**
20-21-A--02-11	Miscellaneous: Total Suspended Solids	**Supplier Product Code: METHOD**: SM 2540D **METHOD DETECTION LIMIT**: 2.5 mg/L	**First Offer -** $10.00	2 / each	**$20.00**	**Y**
20-21-A--02-12	Miscellaneous: Percent Solids (%)	**Supplier Product Code: METHOD**: ASTM D2974-87 **METHOD DETECTION LIMIT**: NA	**First Offer -** $10.00	4 / each	**$40.00**	**Y**
20-21-A--02-13	Miscellaneous: Ammonia Nitrogen	**Supplier Product Code: METHOD**: SM 4500NH3 **METHOD DETECTION LIMIT**: 0.1 mg/L	**First Offer -** $18.00	4 / each	**$72.00**	**Y**
20-21-A--02-14	Miscellaneous: Gross Alpha (pCi/L)	**Supplier Product Code: METHOD**: 900.0 **METHOD DETECTION LIMIT**: 2.865	**First Offer -** $25.00	10 / each	**$250.00**	**Y**

		pCi/L				
20-21-A--02-15	Miscellaneous: Gross Beta (pCi/L)	**Supplier Product Code: METHOD**: 900.0 **METHOD DETECTION LIMIT**: 2.932 pCi/L	**First Offer -** $25.00	10 / each	**$250.00**	**Y**
20-21-A--02-16	Miscellaneous: E-coli	**Supplier Product Code: METHOD**: SM 9223 MPN **METHOD DETECTION LIMIT**: colonies/100 mls	**First Offer -** $35.00	4 / each	**$140.00**	**Y**
20-21-A--02-17	Miscellaneous: Fecal Coliform	**Supplier Product Code: METHOD**: SM 9222D **METHOD DETECTION LIMIT**: colonies/100mls	**First Offer -** $35.00	4 / each	**$140.00**	**Y**
20-21-A--02-18	Miscellaneous: Cryptosporidium	**Supplier Product Code: METHOD**: 1623.1 **METHOD DETECTION LIMIT**: cysts/L	**First Offer -** $530.00	10 / each	**$5,300.00**	**Y**
20-21-A--02-19	Miscellaneous: Dissolved Organic Carbon	**Supplier Product Code: METHOD**: SM 5310C **METHOD DETECTION LIMIT**: 0.5 mg/L	**First Offer -** $35.00	36 / each	**$1,260.00**	**Y**
20-21-A--02-20	Miscellaneous: Geosmin	**Supplier Product Code: METHOD**: 6040D-2011 **METHOD DETECTION**	**First Offer -** $142.50	2 / each	**$285.00**	**Y**

		LIMIT: 5 ng/L				
20-21-A--02-21	Miscellaneous: Methylisoborneol	**Supplier Product Code: METHOD**: 6040D-2011 **METHOD DETECTION LIMIT**: 10 ng/L	**First Offer -** $142.50	2 / each	**$285.00**	**Y**
20-21-A--02-22	Miscellaneous: 2, 4, 6 Trichlororoanisole	**Supplier Product Code: METHOD**: 6040D **METHOD DETECTION LIMIT**: 10 ng/L	**First Offer -** $5.00	12 / each	**$60.00**	**Y**
20-21-A--02-23	Miscellaneous: Total Kjeldahl Nitrogen	**Supplier Product Code: METHOD**: SM 4500-Norg-D **METHOD DETECTION LIMIT**: 0.2 mg/L	**First Offer -** $30.00	12 / each	**$360.00**	**Y**
20-21-A--02-24	Miscellaneous: Total Nitrogen	**Supplier Product Code: METHOD**: various **METHOD DETECTION LIMIT**: various	**First Offer -** $45.00	12 / each	**$540.00**	**Y**
20-21-A--02-25	Miscellaneous: Phosphorous	**Supplier Product Code: METHOD**: SM 4500-P **METHOD DETECTION LIMIT**: 0.01 mg/L	**First Offer -** $20.00	12 / each	**$240.00**	**Y**
				Lot Total	$19,925.00	

Item #	Line Item	Notes	Unit Price	Qty/Unit		Attch.	Docs
20-21-A--03-01	Group Costs: : Metal Finishing Metals	**Supplier Product Code: METHOD**: various **METHOD DETECTION**	**First Offer -** $67.00	8 / each	**$536.00**		**Y**

		LIMIT: various				
20-21-A--03-02	Group Costs: : Local Limits	**Supplier Product Code: METHOD**: various **METHOD DETECTION LIMIT**: various	**First Offer -** $94.00	180 / each	**$16,920.00**	**Y**
20-21-A--03-03	Group Costs: : Purgeable Halocarbons	**Supplier Product Code: METHOD**: 601 **METHOD DETECTION LIMIT**: various	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--03-04	Group Costs: : Purgeable Aromatics	**Supplier Product Code: METHOD**: 602 **METHOD DETECTION LIMIT**: various	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--03-05	Group Costs: : Phenols	**Supplier Product Code: METHOD**: 420.1 **METHOD DETECTION LIMIT**: 0.01 mg/L	**First Offer -** $35.00	10 / each	**$350.00**	**Y**
20-21-A--03-06	Group Costs: : Phthalate Esters	**Supplier Product Code: METHOD**: 606 **METHOD DETECTION LIMIT**: various	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--03-07	Group Costs: : Organochlorine Pesticides & PCB's	**Supplier Product Code: METHOD**: 608	**First Offer -** $120.00	4 / each	**$480.00**	**Y**

		METHOD DETECTION LIMIT: various				
20-21-A--03-08	Group Costs: : Nitroaromatics and Isophorone	**Supplier Product Code: METHOD**: 609 **METHOD DETECTION LIMIT**: various	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--03-09	Group Costs: : Polynuclear Aromatic Hydrocarbons	**Supplier Product Code: METHOD**: 612 **METHOD DETECTION LIMIT**: various	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--03-10	Group Costs: : Haloethers	**Supplier Product Code: METHOD**: 611 **METHOD DETECTION LIMIT**: various	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--03-11	Group Costs: : Chlorinated Hydrocarbons	**Supplier Product Code: METHOD**: 612 **METHOD DETECTION LIMIT**: various	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--03-12	Group Costs: : Purgeables	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: various	**First Offer -** $45.00	4 / each	**$180.00**	**Y**
20-21-A--03-13	Group Costs: : Base/Neutrals and Acids	**Supplier Product Code:**	**First Offer -** $150.00	6 / each	**$900.00**	**Y**

		METHOD: 625 **METHOD DETECTION LIMIT**: various				
20-21-A--03-14	Group Costs: : EPA 126 Priority Pollutant Scan	**Supplier Product Code: METHOD**: various **METHOD DETECTION LIMIT**: various	**First Offer -** $520.00	12 / each	**$6,240.00**	**Y**
20-21-A--03-15	Group Costs: : Total Petroleum Hydrocarbons	**Supplier Product Code: METHOD**: TX 1005 **METHOD DETECTION LIMIT**: various	**First Offer -** $30.00	4 / each	**$120.00**	**Y**
20-21-A--03-16	Group Costs: : BTX Analysis	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: various	**First Offer -** $25.00	4 / each	**$100.00**	**Y**
20-21-A--03-17	Group Costs: : Volatile organic Compounds	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: various	**First Offer -** $70.00	4 / each	**$280.00**	**Y**
20-21-A--03-18	Group Costs: : Semi-Volatile Organic Compounds	**Supplier Product Code: METHOD**: 625 **METHOD DETECTION LIMIT**: various	**First Offer -** $150.00	4 / each	**$600.00**	**Y**
20-21-A--03-19	Group Costs: :	**Supplier**	**First Offer -** $650.00	4 / each	**$2,600.00**	**Y**

	Toxicity Characteristic Leaching Prodcedure	**Product Code:** **METHOD**: 1311 **METHOD DETECTION LIMIT**: various				
20-21-A--03-20	Group Costs: : Soil Analysis for PCB's (MG/KG)	**Supplier Product Code:** **METHOD**: 8082 **METHOD DETECTION LIMIT**: various	**First Offer -** $60.00	4 / each	**$240.00**	**Y**
				Lot Total	$29,686.00	

Item #	Line Item	Notes	Unit Price	Qty/Unit		Attch.	Docs
20-21-A--04-01	40 CFR Part 122 Appendix D: Table II	**Supplier Product Code:** **METHOD**: various **METHOD DETECTION LIMIT**: various	**First Offer -** $340.00	4 / each	**$1,360.00**		**Y**
20-21-A--04-02	40 CFR Part 122 Appendix D: Table III (Wastewater)	**Supplier Product Code:** **METHOD**: various **METHOD DETECTION LIMIT**: various	**First Offer -** $160.00	24 / each	**$3,840.00**		**Y**
20-21-A--04-03	40 CFR Part 122 Appendix D: Table III (Sludge)	**Supplier Product Code:** **METHOD**: various **METHOD DETECTION LIMIT**: various	**First Offer -** $160.00	10 / each	**$1,600.00**		**Y**
20-21-A--04-04	40 CFR Part 122 Appendix D: Table IV	**Supplier Product Code:** **METHOD**: various **METHOD**	**First Offer -** $385.00	4 / each	**$1,540.00**		**Y**

		DETECTION LIMIT: various					
20-21-A--04-05	40 CFR Part 122 Appendix D: Table V	**Supplier Product Code: METHOD**: various **METHOD DETECTION LIMIT**: various	**First Offer -** $300.00	4 / each	**$1,200.00**		**Y**
20-21-A--04-06	40 CFR Part 122 Appendix D: EP Toxicity	**Supplier Product Code: METHOD**: 1310 **METHOD DETECTION LIMIT**: various	**First Offer -** $5.00	2 / each	**$10.00**		**Y**
				Lot Total	$9,550.00		

Item #	Line Item	Notes	Unit Price	Qty/Unit		Attch.	Docs
20-21-A--05-01	Miscellaneous Organic Compounds: Acetone	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $5.00	8 / each	**$40.00**		**Y**
20-21-A--05-02	Miscellaneous Organic Compounds: Benzene	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 2 ug/L	**First Offer -** $5.00	4 / each	**$20.00**		**Y**
20-21-A--05-03	Miscellaneous Organic Compounds: Toluene	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 5 ug/L	**First Offer -** $5.00	4 / each	**$20.00**		**Y**
20-21-A--05-04	Miscellaneous Organic Compounds: Xylene	**Supplier Product Code:**	**First Offer -** $5.00	6 / each	**$30.00**		**Y**

		METHOD: 624 **METHOD DETECTION LIMIT**: 6 ug/L				
20-21-A--05-05	Miscellaneous Organic Compounds: Formaldehyde	**Supplier Product Code: METHOD**: NIOSH 3500 **METHOD DETECTION LIMIT**: 0.1 mg/L	**First Offer -** $25.00	2 / each	**$50.00**	**Y**
20-21-A--05-06	Miscellaneous Organic Compounds: Methylene Chloride	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 5 ug/L	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--05-07	Miscellaneous Organic Compounds: Butanol	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--05-08	Miscellaneous Organic Compounds: Isobutanol	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--05-09	Miscellaneous Organic Compounds: Naphthalene	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--05-10	Miscellaneous Organic Compounds: 2-	**Supplier Product Code:**	**First Offer -** $5.00	4 / each	**$20.00**	**Y**

	Butoxyethanol	**METHOD**: 624 **METHOD DETECTION LIMIT**: 10 ug/L				
20-21-A--05-11	Miscellaneous Organic Compounds: Vinyl Acetate	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--05-12	Miscellaneous Organic Compounds: Tetrachloroethylene	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--05-13	Miscellaneous Organic Compounds: Methyl Ethyl Ketone	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $5.00	8 / each	**$40.00**	**Y**
20-21-A--05-14	Miscellaneous Organic Compounds: 1, 1, 1 Trichloroethane	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $5.00	4 / each	**$20.00**	**Y**
20-21-A--05-15	Miscellaneous Organic Compounds: Butyl Benzyl Phthalate	**Supplier Product Code: METHOD**: 625 **METHOD DETECTION LIMIT**: 3 ug/L	**First Offer -** $5.00	8 / each	**$40.00**	**Y**
20-21-A--05-16	Miscellaneous Organic	**Supplier Product**	**First Offer -** $5.00	8 / each	**$40.00**	**Y**

	Compounds: Di-N-Butyl Phthalate	**Code:** **METHOD**: 625 **METHOD DETECTION LIMIT**: 3 ug/L					
					Lot Total	$440.00	
Item #	Line Item	**Notes**	Unit Price	Qty/Unit		Attch.	Docs
20-21-A--06-01	Group Costs: : Group A	**Supplier Product Code:**	**First Offer -** $113.00	16 / each	**$1,808.00**		**Y**
20-21-A--06-02	Group Costs: : Group B	**Supplier Product Code:**	**First Offer -** $120.00	4 / each	**$480.00**		**Y**
20-21-A--06-03	Group Costs: : Group C	**Supplier Product Code:**	**First Offer -** $257.00	12 / each	**$3,084.00**		**Y**
20-21-A--06-04	Group Costs: : Group D	**Supplier Product Code:**	**First Offer -** $150.00	1 / each	**$150.00**		**Y**
20-21-A--06-05	Group Costs: : Group E	**Supplier Product Code:**	**First Offer -** $827.00	1 / each	**$827.00**		**Y**
					Lot Total	$6,349.00	
Item #	Line Item	**Notes**	Unit Price	Qty/Unit		Attch.	Docs
20-21-A--07-01	Additional Water Quality Standards: Bis(chloromethyl) ether	**Supplier Product Code:** **METHOD**: No approved method **METHOD DETECTION LIMIT**: cannot be analyzed	**First Offer -** $5.00	6 / each	**$30.00**		**Y**
20-21-A--07-02	Additional Water Quality Standards: Carbaryl	**Supplier Product Code:** **METHOD**: 632 **METHOD DETECTION LIMIT**: 0.05 ug/L	**First Offer -** $50.00	6 / each	**$300.00**		**Y**
20-21-A--07-03	Additional Water Quality Standards: Chloropyrifos	**Supplier Product Code:** **METHOD**:	**First Offer -** $42.00	6 / each	**$252.00**		**Y**

		1657 **METHOD DETECTION LIMIT**: 0.02 ug/L				
20-21-A--07-04	Additional Water Quality Standards: Cresols	**Supplier Product Code: METHOD**: 625 **METHOD DETECTION LIMIT**: 3 ug/L	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-05	Additional Water Quality Standards: 2,4-D	**Supplier Product Code: METHOD**: 615 **METHOD DETECTION LIMIT**: 0.0174 ug/L	**First Offer -** $75.00	6 / each	**$450.00**	**Y**
20-21-A--07-06	Additional Water Quality Standards: Danitol	**Supplier Product Code: METHOD**: No approved method **METHOD DETECTION LIMIT**: cannot be analyzed	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-07	Additional Water Quality Standards: Demeton	**Supplier Product Code: METHOD**: 1657 **METHOD DETECTION LIMIT**: 0.01 ug/L	**First Offer -** $42.00	6 / each	**$252.00**	**Y**
20-21-A--07-08	Additional Water Quality Standards: Diazinon	**Supplier Product Code: METHOD**: 1657 **METHOD DETECTION LIMIT**: 0.01 ug/L	**First Offer -** $42.00	6 / each	**$252.00**	**Y**
20-21-A--07-09	Additional Water	**Supplier**	**First Offer -** $42.00	6 / each	**$252.00**	**Y**

	Quality Standards: Dicofol	**Product Code:** **METHOD**: 617 **METHOD DETECTION LIMIT**: 0.5 ug/L				
20-21-A--07-10	Additional Water Quality Standards: Dioxin/Furans	**Supplier Product Code:** **METHOD**: 1613 **METHOD DETECTION LIMIT**: various	**First Offer -** $150.00	6 / each	**$900.00**	**Y**
20-21-A--07-11	Additional Water Quality Standards: Diuron	**Supplier Product Code:** **METHOD**: 632 **METHOD DETECTION LIMIT**: 0.05 ug/L	**First Offer -** $50.00	6 / each	**$300.00**	**Y**
20-21-A--07-12	Additional Water Quality Standards: Guthion	**Supplier Product Code:** **METHOD**: 1657 **METHOD DETECTION LIMIT**: 0.01 ug/L	**First Offer -** $42.00	6 / each	**$252.00**	**Y**
20-21-A--07-13	Additional Water Quality Standards: Hexachlorophene	**Supplier Product Code:** **METHOD**: 604.1 **METHOD DETECTION LIMIT**: 10 ug/L	**First Offer -** $90.00	6 / each	**$540.00**	**Y**
20-21-A--07-14	Additional Water Quality Standards: Malathion	**Supplier Product Code:** **METHOD**: 1657 **METHOD DETECTION LIMIT**: 0.01 ug/L	**First Offer -** $42.00	6 / each	**$252.00**	**Y**

20-21-A--07-15	Additional Water Quality Standards: Methoxychlor	**Supplier Product Code:** **METHOD**: 617 **METHOD DETECTION LIMIT**: 0.02 ug/L	**First Offer -** $42.00	6 / each	**$252.00**	**Y**
20-21-A--07-16	Additional Water Quality Standards: Mirex	**Supplier Product Code:** **METHOD**: 617 **METHOD DETECTION LIMIT**: 0.02 ug/L	**First Offer -** $42.00	6 / each	**$252.00**	**Y**
20-21-A--07-17	Additional Water Quality Standards: Nitrate·Nitrogen	**Supplier Product Code:** **METHOD**: 300.0 **METHOD DETECTION LIMIT**: 0.01 mg/L	**First Offer -** $15.00	6 / each	**$90.00**	**Y**
20-21-A--07-18	Additional Water Quality Standards: N-Nitrosodiethylamine	**Supplier Product Code:** **METHOD**: 625 **METHOD DETECTION LIMIT**: 3 ug/L	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-19	Additional Water Quality Standards: N·Nitroso-di-n-Butylamine	**Supplier Product Code:** **METHOD**: 625 **METHOD DETECTION LIMIT**: 3 ug/L	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-20	Additional Water Quality Standards: Parathion	**Supplier Product Code:** **METHOD**: 1657 **METHOD DETECTION LIMIT**: 0.02 ug/L	**First Offer -** $42.00	6 / each	**$252.00**	**Y**

20-21-A--07-21	Additional Water Quality Standards: Pentachlorobezene	**Supplier Product Code:** **METHOD**: 625 **METHOD DETECTION LIMIT**: 5 ug/L	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-22	Additional Water Quality Standards: Pyridine	**Supplier Product Code:** **METHOD**: 625 **METHOD DETECTION LIMIT**: 3 ug/L	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-23	Additional Water Quality Standards: 1,2-Dibromoethane	**Supplier Product Code:** **METHOD**: 624 **METHOD DETECTION LIMIT**: 2 ug/L	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-24	Additional Water Quality Standards: 1,2,4,5-Tetrachlorobenzene	**Supplier Product Code:** **METHOD**: 625 **METHOD DETECTION LIMIT**: 3 ug/L	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-25	Additional Water Quality Standards: 2,4,5-TP (Silvex)	**Supplier Product Code:** **METHOD**: 615 **METHOD DETECTION LIMIT**: 0.0152 ug/L	**First Offer -** $75.00	6 / each	**$450.00**	**Y**
20-21-A--07-26	Additional Water Quality Standards: Tributyltin	**Supplier Product Code:** **METHOD**: only required for discharges into salt water **METHOD DETECTION LIMIT**: only	**First Offer -** $5.00	6 / each	**$30.00**	**Y**

		required for discharges into salt water				
20-21-A--07-27	Additional Water Quality Standards: 2,4,5-Trichlorophenol	**Supplier Product Code: METHOD**: 625 **METHOD DETECTION LIMIT**: 3 ug/L	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-28	Additional Water Quality Standards: TTHM (Total Trihalomethanes)	**Supplier Product Code: METHOD**: 624 **METHOD DETECTION LIMIT**: various	**First Offer -** $5.00	6 / each	**$30.00**	**Y**
20-21-A--07-29	Additional Water Quality Standards: Bromate	**Supplier Product Code: METHOD**: 300.1 **METHOD DETECTION LIMIT**: 0.01 mg/L	**First Offer -** $80.00	2 / each	**$160.00**	**Y**
				Lot Total	$5,818.00	

Item #	Line Item	Notes	Unit Price	Qty/Unit		Attch.	Docs
20-21-A--08-01	Pick up/Courier Charges: Pick up/Courier Charges	**Supplier Product Code:**	**First Offer -** $27.00	100 / each	**$2,700.00**		**Y**
				Lot Total	$2,700.00		
					Supplier Total	**$75,852.00**	

Pace Analytical Services, Inc.

Item: **METALS:Cadmium**

Attachments

2019 Key Personnel.pdf

Close Out + CA Response_TNI 2018.pdf

Dallas Org Chart Oct 2019.pdf

Pace Dallas List of Instruments for RFPs.xlsx

Pace Dallas Testing Capabilities.pdf

Pace Data Reporting Capabilities.doc

Primary Municipal References 2019 for Lewisville.doc

QAM rev.19 - FINAL 042717 - uncontrolled.pdf

Pace Analytical Services, LLC
400 W. Bethany Drive – Suite 190
Allen, TX 75013
Phone: 972.727.1123
Fax: 972.727.1175

KEY PERSONNEL RESUME

Manager: Tim Gramling

Mr. Gramling joined Pace Analytical in March of 2005. Since September of 2018, he has been responsible for the Texas laboratory operations in Dallas and Fort Worth ensuring that the laboratories comply with all local, state and federal regulatory standards and monitoring the lab operations, customer satisfaction and quality systems.

Prior to his current position, Mr. Gramling assisted with a laboratory integration in Salina, KS and served as the Inorganics Manager in Lenexa, KS for eight years. He was also the metals coordinator for PACE's 3P (Lean) team for sixteen months. Prior to PACE, Mr. Gramling served as the Metals Supervisor at Ecology and Environment in Lancaster, NY. In this capacity, he was responsible for a staff of seven technicians and analysts. He trained staff, reviewed data and monitored the production process. Prior to joining Ecology and Environment, Mr. Gramling served as a metals analyst and technical lead for for EnChem in Madison, WI. His responsibilities included the operation and maintenance of GFAA, ICP, HGAA and ICPMS instrumentation. Prior to joining EnChem, Mr. Gramling served as a metals analyst for for Interpoll Labs in Circle Pines, MN. His responsibilities included the preparation and analysis of samples via GFAA, ICP, and FLAA instrumentation.

Mr. Gramling obtained his B.S. in Chemistry from the University of Wisconsin-Madison.

Quality Manager: Elizabeth Turner

Ms. Turner joined Pace Analytical Services in 2019. She is responsible for maintaining and implementation of Pace Labs quality systems for Dallas location, including conducting and documenting trainings, maintaining certifications, reviewing and administering QA documents, assisting the lab in identification of systematic problems and make recommendations for resolutions, assisting project management group with Project Plans and QAPPs, and technical resources.

Ms. Turner has over 20 years of experience in the environmental laboratory industry. Her expertise is with drinking water, wastewater and stormwater analysis. She is the current Chair of the Water Quality Laboratory committee for the American Water Works Association, Chair of the Laboratory Committee for the Texas Water Environment Association and is involved with other professional organizations. Ms. Turner earned her B.S in Biology from Stockton State College and her M.S. from Virginia Polytechnical Institute and University. Ms. Turner is also a licensed drinking water operator and licensed wastewater operator for the state of Texas.

Operations Manager: Peggy Siegfried

Ms. Siegfried joined Pace Analytical Services in 2013. With Pace, she served as Project Manager, Client Services Manager and Quality Assurance Manager prior beginning her current roll as Operations Manager at the start of 2019. She is responsible for daily production and technical responsibilities for laboratory operations including conducting and documenting trainings, data reviews, assisting the lab in

identification of systematic problems and make recommendations for resolutions, assisting project management group with Project Plans and QAPPs, and technical resources.

Ms. Siegfried has over 12 years experiences in the environmental laboratory industry. Her experience includes the analyses of PCBs, Pesticides, and Diesel Range Organics using routing GC/ECD and GC/FID technology, as applicable. Ms. Siegfried came to Pace from TestAmerica Portland, where she worked as Sample Receiving Supervisor, GCSV analyst, and Project Manager. Ms. Siegfried earned her B.S in Biology from Metropolitan State University of Denver.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

September 10, 2018

Ms. Peggy Siegfried
Pace Analytical Services - Dallas
400 West Bethany, Suite 190
Allen, Texas 75013-3714

Dear Ms. Siegfried:

I am writing concerning your corrective action responses for Assessment #A18-41 conducted in April-May 2018.

The Texas Commission on Environmental Quality concurs with the responses provided by Pace Analytical Services to the report for the assessment conducted in April-May 2018. This letter closes Assessment #A18-41.

Please contact Mr. Frank Jamison at (512) 239-3754 or frank.jamison@tceq.texas.gov if we can provide any additional information or assistance.

Sincerely,

Louise L. McGinley
Assessor, Laboratory Accreditation
Monitoring Division

cc: Mr. Tony Walker, TCEQ Region 4, Dallas/Fort Worth
Mr. Frank Jamison, TCEQ
Ms. Kristy Deaver, TCEQ

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	M-3 Document and Records Control
Deficiency:	TNI V1M2-4.3.2.1: The laboratory's master list of documents (DAL SOP Tracking) had not included the distribution of documents in the management system. Laboratory management stated, in general, most SOPs were available to all staff as three electronic copies. The distribution of these documents had not been established.

Corrective Action(s) (CA) to Address the Deficiency:	The laboratory SOP tracking spreadsheet has been updated to include documentation of all locations where electronic copies of the SOPs are maintained and to include dates of distribution for all locations.
Timetable(s) for Implementation of CA:	Completed 6/12/18
Means to Document Corrective Action(s):	Documentation of the corrective action can be found on the laboratory SOP tracking spreadsheet (DAL SOP Tracking). Only QA personnel have access to this tracking spreadsheet and all QA personnel were involved in determining the chosen corrective action for this deficiency; additional training is therefore not required.

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory Document Control and Management SOP, S-DAL-Q-002, has been revised (rev.03) to include specification that distribution of all electronic documents including SOPs must be tracked and documented. Locations where the laboratory maintains electronic copies of documents have also been added to this SOP. See S-DAL-Q-002-rev.03 Section 12.4.3.1. The laboratory tracking spreadsheet for non-SOP documents was also reviewed to ensure that proper documentation of distribution is maintained. This tracking sheet was found to comply with the requirements TNI V1M2-4.3.2.1. The laboratory SOP for Document Control and Management, S-DAL-Q-002 was also reviewed to ensure that the requirement for distribution documentation and tracking of non-SOP documents was included. Section 12.4.3.2 was found to include this requirement. All applicable staff were trained on the revised procedures in SOP S-DAL-Q-002-rev.03 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system.
Timetable(s) for Implementation of APR:	Completed 6/25/18
Means to Document Action(s) to Prevent Recurrence:	See S-DAL-Q-002-rev.03 Section 12.4.3.1 and associated training records in the Laboratory Management System (LMS)

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**

Action(s) for Client Notification:	N/A
Timetable(s) for Client Notification:	N/A
Means to Document Client Notification(s):	N/A

Verification of Effectiveness:	Effectiveness will be determined by continued and appropriate documentation of distribution dates within the applicable fields in the laboratory document control tracking spreadsheets (for both SOPs and non-SOP documents).
Timetable(s) for Verification:	Immediate and ongoing verification of effectiveness will occur in general review of the tracking spreadsheets each time one is opened for review or edit as well as a thorough review of documentation during the annual Quality Systems audit of Document Control procedures scheduled for November 2018.
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6312. Internal audit records of quality system audits will provide ongoing documentation of verification.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-1 Analytical and Program Requirements. a. EPA Method 1664, Revision A
Deficiency:	Section 10.1 of the reference method requires the analytical balance to be calibrated at 2 mg and 1000 mg. Section 12.1.7 of the laboratory SOP instructs the analyst to calibrate at 0.1, 50.0, and 200.0 g weights. Records indicated the balance used had been calibrated following the SOP procedure.

Corrective Action(s) (CA) to Address the Deficiency:	The daily verification points for the balance (75BAL2) utilized for Oil and Grease Method 1664A have been updated to include the 2 mg and 1000 mg weights. A new balance calibration logbook, DAL-0438, using the required weights was issued to the lab on May 8, 2018. The laboratory confirmed that weights previously used for the daily balance verifications spanned the laboratory's reporting range for the method. The balance was verified each day to an accuracy of ± 2% spanning the reportable range and therefore data reported was determined to be valid.
Timetable(s) for Implementation of CA:	Completed 5/8/18
Means to Document Corrective Action(s):	Logbook Form number F-DAL-Q-067 was revised (rev.02) to include the 2 mg and 1000 mg weights required by Method 1664A. Training for the change in calibration points was performed verbally with the applicable department when the new logbook (DAL-0438) was distributed to the lab and the previous logbook was removed from service by QA. As only the weights used were changed and actual calibration procedures did not change, no further training is required for the new logbook. An email following up on the verbal training of the new logbook was issued to all applicable personnel on 8/4/18. A copy of this email has been placed in personnel training files as documentation of the training performed.

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory has updated SOP S-DAL-O-044-rev.03, Oil & Grease by Method 1664A, to include use of the method required weights in section 12.7 and to specify in section 11.1.1 that use of 2 mg and 1000mg weights for balance calibration is required by the method. All applicable staff were trained on the revised procedures in SOP S-DAL-O-044-rev.03 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system. The laboratory is in the process of performing an in-depth Method-SOP-Practice comparison of other Method-defined analytes reported by the laboratory to ensure that modifications have not been made to these procedures.
Timetable(s) for Implementation of APR:	SOP Update Completed 06/25/18 Method-defined analyte Method-SOP-Practice reviews are expected to be completed by 8/31/18.
Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-O-044-rev.03 Sections 11.1.1 and 12.7 and associated training records in the Laboratory Learning Management System (LMS)

	Form FMT-DAL-Q-089-rev.00, Method-SOP-Practice Comparison, will be used to document reviews of other Method-defined analytes.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	Immediate follow up monitoring is not necessary; however, the SOP updates made to S-DAL-O-044-rev.03 included specification that use of the applicable weights is required by the method to ensure that future SOP revisions do not remove these weights from use. On-going monitoring of the change in practice will be conducted during routine internal audits of the method, as well as general logbook audits.
Timetable(s) for Verification:	Logbook audit is expected to be completed by 10/31/18
Means to Document Verification:	Records of internal audits will provide documentation of verification that the change in practice has been maintained by the laboratory.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-1 Analytical and Program Requirements b. Standard Methods 9221, 9222, and 9223
Deficiency:	Section 17 of laboratory SOP, "QC and Maintenance for Microbiology," instructs the analyst to utilize IDEXX SimPlate for monitoring air quality. Section 3.b.e of Standard Method 9020 requires the use of settling plates (non-selective agar).

Corrective Action(s) (CA) to Address the Deficiency:	The laboratory has ordered Tryptic Soy Agar (TSA) plates. The TSA plates are expected to arrive the first week of July, and will be used for the July 2018 air quality test. SOP S-DAL-MB-012-rev.03, QC and Maintenance for Microbiology, was updated to include use of, and procedures for, the TSA plates for air quality testing in section 17.1. All applicable staff were trained on the revised procedures in SOP S-DAL-MB-012-rev.03 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system.
Timetable(s) for Implementation of CA:	Expected completion 7/15/18
Means to Document Corrective Action(s):	See Purchase Order # PO1307265 See SOP S-DAL-MB-012-rev.03 and associated training records in the Laboratory Learning Management System (LMS).

Action(s) to Prevent Recurrence (APR) of the Deficiency:	Section 11.3 was added to SOP S-DAL-MB-012-rev.03, QC and Maintenance for Microbiology, specifically stating that the SimPlate method cannot be used for the air quality testing. A note was also placed in the revision history, section 27, stating not to remove this specification in future revisions. All applicable staff were trained on the revised procedures in SOP S-DAL-MB-012-rev.03 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system. Additionally, laboratory practices will be audited against other microbiology methods and SM 9020B requirements for other possible similar instances or discrepancies.
Timetable(s) for Implementation of APR:	SOP Update Completed 6/29/18 Review for similar instances is expected to be completed by 9/31/18
Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-MB-012-rev.03 and associated training records in the Laboratory Management System (LMS). Laboratory review for similar instances will be documented via associated internal audit records.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**

Action(s) for Client Notification:	N/A
Timetable(s) for Client Notification:	N/A
Means to Document Client Notification(s):	N/A

Verification of Effectiveness:	Verification of effectiveness will be completed by reviewing records for monthly air quality checks and sterility checks on new supply lots received. These reviews will be completed as part of routine quarterly raw data reviews, which include verification of compliance with SM 9020 QC requirements for micro work
Timetable(s) for Verification:	Expected Completion by 9/30/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket #6314.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-1 Analytical and Program Requirements c. Standard Method 2540 D - 2011
Deficiency:	1. Section 3.a of the reference method requires the analyst to place the filter on the apparatus with the wrinkled side up. Laboratory SOP "Determination of Total Suspended Solids (Non-filterable Residue)," did not contain this requirement. Laboratory staff stated filters are placed wrinkled side up. 2. Section 12.2.12 of the laboratory's SOP instructs the analyst to place samples in the drying oven for 30 minutes for the second drying cycle. Section 3.c of the reference method requires at least one hour for the second drying cycle.

Corrective Action(s) (CA) to Address the Deficiency:	1. The laboratory SOP for TSS, S-DAL-I-020-rev.05, was updated to add specification that filters must be placed wrinkled side up in section 12.2.4. 2. The laboratory's standard practice is to leave samples in the drying oven overnight for the first drying cycle and therefore the laboratory considers samples to be dry following the initial drying cycle and use of a 30-minute second drying cycle as adequate to demonstrate samples have dried completely. The laboratory's review of the applicable TSS SOP, S-DAL-I-020, does indicate that the SOP was lacking sufficient detail regarding this standard practice, as well as specification that a minimum of 1 hour dry time is required for each drying cycle when samples are not allowed to dry overnight initially. The SOP has been updated to document use of an initial overnight drying cycle in Section 12.2.10, and to specify the required 1 hour drying cycles when samples cannot be dried overnight in Section 12.2.13 Note. Additionally, use of an overnight drying cycle with 30-minute subsequent drying cycles has been added to the SOP as a modification in Section 19.2. All applicable staff were trained on the revised procedures in SOP S-DAL-I-020-rev.05 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system.
Timetable(s) for Implementation of CA:	Completed 06/26/18.
Means to Document Corrective Action(s):	1. and 2. See SOP S-DAL-I-020-rev.05 and associated training records in the Laboratory Learning Management System (LMS)

Action(s) to Prevent Recurrence (APR) of the Deficiency:	Laboratory SOPs for other solids tests have been reviewed, and revised as necessary to ensure that filter placement is documented, where applicable, and that drying times in use match the cited methods or include appropriate details. (S-DAL-I-018-rev.05 – TDS also required revision) Where applicable, training for SOP revisions was provided to appropriate staff via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system.
Timetable(s) for Implementation of APR:	Completed 6/26/18.

Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-I-018-rev.05 and associated training records in the Laboratory Learning Management System (LMS) Review of Laboratory SOPs for other solids tests is documented in the Laboratory Corrective Action System (LabTrack) under Ticket # 6315.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	Effectiveness of these corrective and preventative actions will be verified by QA's confirmation during routine raw data and procedural audits that the applicable changes to documented procedures have been implemented and are being followed in laboratory practice.
Timetable(s) for Verification:	Expected completion by July 31, 2018.
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket #6315.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-1 Analytical and Program Requirements d. Standard Method 2540 C – 2011
Deficiency:	Section 3.b of the reference method instructs the analyst to weigh evaporation dishes prior to use. The laboratory utilized StableWeigh TDS vessels with weights predetermined by the manufacturer. Laboratory staff stated these preweighed vessels not verified at least once per lot. Records of weight checks could not be retrieved.

Corrective Action(s) (CA) to Address the Deficiency:	The laboratory has implemented a per-lot weight verification for the TDS vessels. Logbook DAL-0436 was created and issued to the laboratory on 5/1/18 for documentation of these lot checks. Training on the new logbook was performed by QA at the time the logbook was issued to the laboratory.
Timetable(s) for Implementation of CA:	Completed 5/1/18
Means to Document Corrective Action(s):	See Logbook DAL-0436, and the associated logbook template form F-DAL-I-051-rev.00, TDS StableWeigh Bags. An email following up on the verbal training of the new logbook was issued to all applicable personnel on 8/4/18. A copy of this email has been placed in personnel training files as documentation of the training performed.

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory has updated the TDS SOP, S-DAL-I-018-rev.05, to include weight checks on one StableWeigh vessel per lot received in section 12.1. All applicable staff were trained on the revised procedures in SOP S-DAL-I-018-rev.05 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system. Additionally, the laboratory Quality Department is working though a department-by-department review of supplies used to determine if any other instances exist that may require a per-lot verification of vendor supplied information.
Timetable(s) for Implementation of APR:	SOP Update completed 6/26/18 Global review expected to be complete by 8/31/18.
Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-I-018-rev.05 and associated training records in the Laboratory Learning Management System (LMS) Documentation of a global review of supplies will be maintained with laboratory internal audit records.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**

Action(s) for Client Notification:	N/A
Timetable(s) for Client Notification:	N/A
Means to Document Client Notification(s):	N/A

Verification of Effectiveness:	Effectiveness of these corrective and preventative actions will be verified by QA's confirmation during routine raw data and procedural audits that the applicable changes to documented procedures have been implemented and are being followed in laboratory practice.
Timetable(s) for Verification:	Expected completion by July 31, 2018.
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6316.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-2 Test Methods and Method Validation a. EPA method 300.0, Revision 2.1
Deficiency:	Section 11.5 of laboratory SOP, "Determination of Anions by Ion chromatography," required the verification of the linear calibration range of each analyte every six months. Laboratory management stated LCR determinations had not been conducted in 2017 or 2018. Records of LCR studies could not be retrieved.

Corrective Action(s) (CA) to Address the Deficiency:	Linear Calibration Range was verified with evaluation of three standards from the laboratory calibration dated 6/6/18 against the LCR acceptance criteria. Standards CAL2 (1.0 mg/L), CAL4 (10 mg/L) and CAL6 (15 mg/L) were confirmed to be with acceptance criteria specified in the laboratory SOP and Method 300.0 for LCR verification standards (within 10% of true value).
Timetable(s) for Implementation of CA:	Completed 6/6/18
Means to Document Corrective Action(s):	Calibration dated 6/6/18 for instrument ID 75WTA2

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory Anions SOP, S-DAL-I-007-rev.08, has been updated to expand use of the calibration back calculation to include all calibration. Back calculation acceptance criteria for the points used for LCR verification has been established to match method criteria for LCR verification standards (section 11.2 table). Additionally, the SOP has been updated to specify a calibration frequency of at least every 6 months in section 11.4 and to document use of the calibration back calculation for LCR verification in section 11.5.1. Evaluation and acceptance of the applicable calibration standards based on the LCR verification criteria will ensure that the Linear Calibration Range is verified with every calibration. The laboratory Quality Department is working to update other applicable method SOPS to incorporate similar procedures for evaluation of Linear Ranges with each calibration.
Timetable(s) for Implementation of APR:	S-DAL-I-007-rev.08, Anions SOP update completed 6/27/18 Other applicable method SOP updates are expected to complete by 7/15/18.
Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-I-007-rev.08 and associated training records in the Laboratory Learning Management System (LMS) Updates to other applicable SOPs will be documented within the specific SOP revision history. Review of other applicable SOPs will be documented in the Laboratory Corrective Action System (LabTrack) under Ticket # 6317.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**

Action(s) for Client Notification:	N/A
Timetable(s) for Client Notification:	N/A
Means to Document Client Notification(s):	N/A

Verification of Effectiveness:	Effectiveness will be verified by the Quality Department's review of various calibrations for applicable methods and confirmation that LCR verification criteria is being evaluated and met with each calibration during routine raw data audits.
Timetable(s) for Verification:	Verification is expected to be complete by 9/30/18.
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6317.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-2 Test Methods and Method Validation b. EPA Method 1311, Revision 0
Deficiency:	Section 10.1 of laboratory SOP, "Toxicity Characteristic Leaching Procedure (TCLP) and Synthetic Precipitation Leaching Procedure (SPLP) Zero Headspace Extraction (ZHE) for Volatiles," instructs the analyst to prepare Extraction Fluid #1 by adding 5.7 mL glacial acetic acid to 500 mL of reagent water in a 1 L volumetric flask followed by the addition of 64.3 mL of 1 N sodium hydroxide solution, diluting to 1 L. Laboratory staff stated, and records indicated Extraction Fluid #1 had been prepared with 5.3 mL per 1 L. In addition, Extraction Fluid #2 had been prepared with 6.0 mL acetic acid per liter instead of the SOP and method requirement of 5.7 mL acetic acid per liter.

Corrective Action(s) (CA) to Address the Deficiency:	Both extraction fluids have been remade in accordance with the SOP. Records for previous preparations used, going back to January 2017, were reviewed and all indicate pH within the method specified acceptance range; thus, no impact to data is indicated. Additionally, all applicable personnel were re-assigned the associated TCLP SOP S-DAL-M-0-15-rev.03 in the laboratory's Learning Management System (LMS).
Timetable(s) for Implementation of CA:	Completed 6/29/18
Means to Document Corrective Action(s):	See Standard Preparation records for Standard IDs 122943 (Fluid #1) and 123549 (Fluid #2) SOP assignments are documented within the laboratory LMS.

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory has created form F-DAL-M-012-rev.00, TCLP Fluid Preparation, with instructions for proper preparation of the buffers and has posted this form where the buffers are stored and at the laboratory station where the buffers are prepared.
Timetable(s) for Implementation of APR:	Completed 6/29/18
Means to Document Action(s) to Prevent Recurrence:	See Form F-DAL-M-012-rev.00

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	

Means to Document Client Notification(s):	N/A

Verification of Effectiveness:	Effectiveness will be verified by QA review of standard preparation records for the TCLP buffers over the next 6-8 weeks, allowing time for the laboratory to prepare (and QA to review records for) multiple batches of each buffer.
Timetable(s) for Verification:	Expected Completion by 8/31/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket #6318.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-2 Test Methods and Method Validation c. EPA Methods 625 and 8270
Deficiency:	Section 12.6 of laboratory SOP, "Semi-volatile Organics by GCMS," instructs the analyst to analyze at least one method or instrument blank prior to the analysis of any samples. Laboratory staff stated, and records indicated, blanks had not been run prior to the analysis of samples (e.g., batch analyzed 4/28/2018).

Corrective Action(s) (CA) to Address the Deficiency:	The department manager discussed the SOP requirement to analyze a batch or instrument blank after each CCV with the analyst. This discussion was followed up with an email to which the analyst responded with acknowledgement of the requirement. Raw data for the initial sample in the analytical batch referenced in the deficiency (analysis date 4/28/18) was reviewed by the department manager and QA and no signs of carry over or potential data impact were observed.
Timetable(s) for Implementation of CA:	Completed 6/13/18
Means to Document Corrective Action(s):	Referenced email dated 06/13/18 placed in analyst training folder.

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The Data Review Checklist used for GCMS-SVOA data was revised, F-DAL-O-107-rev.04, to include review for analysis and evaluation of an instrument or method blank following the CCV and prior to sample analysis. Training on the updated form was provided to the analyst by QA at the time of implementation. Additionally, a follow-up email was sent from QA to applicable personnel regarding the changes made to the form and to document training performed. Data Review Checklists for other analyses that require a blank be analyzed between the CCV and samples are in the process of revision to include documented review of this requirement.
Timetable(s) for Implementation of APR:	Revision to F-DAL-O-107-rev.04 Completed 6/27/18 Revision to other applicable Data Review Checklists is expected to be complete by 7/6/18.
Means to Document Action(s) to Prevent Recurrence:	See Data Review Checklist F-DAL-O-107-rev.04 and associated training follow-up email dated 8/21/18. Updates to other applicable Data Review Checklists will be documented as revision is completed. Records of these reviews, including a listing of which other checklists are reviewed, and any applicable revisions will be documented in the laboratory's Corrective Action system in the Ticket associated with this audit finding (Ticket # 6319).

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**

Action(s) for Client Notification:	N/A
Timetable(s) for Client Notification:	N/A
Means to Document Client Notification(s):	N/A

Verification of Effectiveness:	Verification of effectiveness will take place by review of instrument run logs and raw data to confirm that blanks are being analyzed between standards and samples, and that these blanks meet the documented criteria. This verification will be completed during routine quarterly raw data audits and MintMiner manual integration/chromatography audits.
Timetable(s) for Verification:	Verification is expected to be complete by 9/30/18.
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6319. Additional documentation will be maintained with raw data and MintMiner audit records.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-2 Test Methods and Method Validation d. EPA Method 9095 A, Revision 1
Deficiency:	Section 9.1 of laboratory SOP, "Paint Filter/Free Liquid," requires the use of a mesh size 60 ± 5% (fine meshed size) conical filter. Laboratory staff identified conical filters of medium size used for analysis.

Corrective Action(s) (CA) to Address the Deficiency:	The laboratory has replaced the conical filters with fine mesh filters.
Timetable(s) for Implementation of CA:	Completed 6/28/18
Means to Document Corrective Action(s):	See Sherwin-Williams Sales receipt dated 6/28/18 and Standard Log 123562

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory SOP S-DAL-I-026-rev.03, Paint Filter / Free Liquid, has been updated to include "fine mesh" in the filter description (rather than the mesh size only) and to include the vendor and part number for further reference in section 9.1. All applicable staff were trained on the revised procedures in SOP S-DAL-I-026-rev.03 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system
Timetable(s) for Implementation of APR:	Completed 6/29/18
Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-I-026-rev.03, Paint Filter / Free Liquid and associated training records in the Laboratory Learning Management System (LMS).

Client Notification:	☐ **N/A.**	☒ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	The laboratory reviewed records and determined that a change in vendor (and subsequently mesh size) for the purchase of the filters used took place in May of 2017. The laboratory determined that notification for samples analyzed in 2017 was not necessary. Decisions regarding samples analyzed in 2017 would already have been made and acted upon; since the laboratory's use of a larger mesh size would cause a potential for a false positive, any material disposed, or decisions made, based on the results provided would have been done in an environmentally conservative manner, therefore notifications were not made. However, the laboratory did query the system and notify clients for samples analyzed in 2018 that reported as "Fail" indicating the presence of free liquids. Notifications were found to be necessary for four samples from two separate clients. All clients associated with these samples have been notified, via letter, of the deviation from the method and the possible impact to the reported results.	

Timetable(s) for Client Notification:	All notifications were issued by 8/29/18.
Means to Document Client Notification(s):	Client notifications will be documented in the laboratory's Corrective Action System, LabTrack, in the Ticket associated with this audit finding (Ticket # 6320). Copies of each email and attached notification letter are stored on the network drive for documentation that notification was made.

Verification of Effectiveness:	Verification of effectiveness will occur by QA's ongoing monitoring and confirmation of filter size in stock and review of associated standard IDs documented as used in the raw data (benchsheets) during routine audits and/or spot check verifications of various corrective action implementations.
Timetable(s) for Verification:	Expected Completion by 9/30/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6320. Documentation of raw data (benchsheets) and associated standard IDs reviewed during routine audits and/or spot checks will be documented within laboratory internal audit records.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-2 Test Methods and Method Validation e. Standard Method 9223 B – 2004
Deficiency:	Section 13 of laboratory SOP, "Determination of Total Coliform and E. coli by Colilert Quanti-Tray and by Colilert Presence/Absence in Water and Drinking Water," required the use of Escherichia coli, Pseudomonas aeruginosa, and Enterobacter aerogenes as control organisms to validate media prior to use. Records indicated the coliform positive/E. coli negative organism, E. aerogenes had not been used as required (e.g., batch #91553).

Corrective Action(s) (CA) to Address the Deficiency:	Additional training and discussion of this requirement was provided to all microbiology analysts by QA during a routine onsite visit to the Fort Worth location (all microbiology work performed by the laboratory is performed at the Fort Worth location). An email to follow up on and document this training was issued by QA to the applicable analysts with reply receipts of acknowledgement and understanding. Media lots received since the time of the audit have been validated with all three controls.
Timetable(s) for Implementation of CA:	Completed 6/18/18
Means to Document Corrective Action(s):	Referenced email dated 6/28/18 will be placed in the training folders of each analyst. See data records for Batch #s 97541 and 99547

Action(s) to Prevent Recurrence (APR) of the Deficiency:	Form F-DAL-MB-011-rev.02, Micro QC Tracking, has been updated to separate each of these three controls into separate line items (previously, there was one line item for Colilert validation). Training on the changes to the form was verbally provided by QA at the time the new form was issued to the laboratory.
Timetable(s) for Implementation of APR:	Completed 6/28/18
Means to Document Action(s) to Prevent Recurrence:	See Form F-DAL-MB-011-rev.02 An email following up on the verbal training on the new form was sent to all applicable personnel on 8/4/18. A copy of this email has been placed in personnel training files as documentation of the training performed.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	

Timetable(s) for Client Notification:	N/A
Means to Document Client Notification(s):	N/A

Verification of Effectiveness:	Effectiveness will be verified by QA's monitoring of the Micro QC forms completed each month to confirm that media is being validated with all necessary controls.
Timetable(s) for Verification:	Expected completion by 8/31/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6321.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-2 Test Methods and Method Validation f. Standard Method 5210 B – 2011
Deficiency:	1. Section 5.b of the reference method requires samples are brought to 20 ± 3℃ prior to analysis. Laboratory staff stated, and records indicated, only samples requiring pH adjustment had their temperatures recorded. 2. Section 5.e of the reference method requires the analyst to add nitrification inhibitor only after bottles are 2/3 filled with sample and/or dilution water. Laboratory staff stated nitrification inhibitor is added immediately after sample is added, including times when sample volumes are less than 200 mL (2/3 full).

Corrective Action(s) (CA) to Address the Deficiency:	1. The laboratory has added fields to the electronic preparation logbook for Method SM 5210B for documentation of sample temperature prior to analysis. Additionally, the electronic preparation log has been programed to mark any temperatures outside of the acceptable range with a red carrot to alert the analyst of non-compliance. Thermometer IR-10 has been issued to the laboratory for this purpose. The analyst had previous experience with use of an IR thermometer in the Sample Receiving department and was involved in determining this corrective action; therefore, no additional training was required. 2. The laboratory has changed practice and now adds the nitrification inhibitor after dilution water has been added to the sample. A sign was posted in the BOD preparation area at the shelf where the Nitrification Inhibitor is kept to remind analysts of the change in procedure. The analyst worked with other network laboratories to determine this corrective action and therefore additional training is not required.
Timetable(s) for Implementation of CA:	1. Completed 5/16/18 2. Completed 6/28/18
Means to Document Corrective Action(s):	1. See electronic prep log template version EF-TX-I-033-rev.03 2. See form F-DAL-I-052-rev.00, Nitrification Inhibitor Sign

Action(s) to Prevent Recurrence (APR) of the Deficiency:	1. The laboratory SOP, S-DAL-I-004-rev.06 for BOD/CBOD, has been updated to include procedures for taking the sample temperature prior to beginning sample dilutions and actions to take if temperature does not meet criteria in section 12.1. 2. Additionally, SOP S-DAL-I-004-rev.06 was updated to change the order of steps in section 12.4.5 and specify that addition of the nitrification inhibitor be done after the robot program adds dilution water. Documentation that the nitrification inhibitor must not be added before bottles are at least 2/3 full was also added to section 12.4.5.13 1. and 2. All applicable staff were trained on the revisions to SOP S-DAL-I-004-rev.06 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system.

Timetable(s) for Implementation of APR:	1. and 2. Completed 6/28/18
Means to Document Action(s) to Prevent Recurrence:	1. and 2. See SOP S-DAL-I-004-rev.06 and associated training records in the Laboratory Learning Management System (LMS)

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	1. Verification of sample temperature documentation and use of the new preparation log fields will be performed during routine quarterly raw data audits, which include sample preparation records. 2. Verification of the change in procedure to add Nitrification Inhibitor after the robot program has added dilution water will be performed by QA observation of the analyst at various times over a the next few weeks.
Timetable(s) for Verification:	1. Expected completion by 8/31/18 2. Expected completion by 7/31/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6322.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-8 Maintenance and Calibration of Support Equipment
Deficiency:	TNI V1M2-5.5.13.1.e: Not all volumetric dispensing devices had been checked for accuracy on a quarterly basis. Records indicated most pipettes, including "75BOD1," had not been checked between 9/27/2017 and 1/18/2018. Records indicated this pipette had been in use during this period.

Corrective Action(s) (CA) to Address the Deficiency:	Review of records indicated that pipette calibration verifications have routinely been completed quarterly with fourth quarter of 2017 as the only significant exception found in the previous two years. Records for verifications completed in first quarter 2018 for all pipettes (included the specified "75BOD1" pipette) do not indicate that any of the pipettes were out of compliance. It is the determination of the laboratory that because applicable pipettes were verified as within calibration in third quarter 2017 and still within calibration when checked in first quarter 2018, that data was not impacted by the missed calibration verifications in fourth quarter 2017.
Timetable(s) for Implementation of CA:	Completed 06/15/18
Means to Document Corrective Action(s):	See pipette calibration records for third quarter 2017 and first quarter 2018.

Action(s) to Prevent Recurrence (APR) of the Deficiency:	An electronic calendar reminder has been established for all analysts working in departments that use volumetric equipment requiring quarterly calibration verifications. The calendar appointment is set to re-occur on the first Monday of every month to notify all analysts to check their volumetric equipment for due or coming due calibrations.
Timetable(s) for Implementation of APR:	Completed 06/28/18
Means to Document Action(s) to Prevent Recurrence:	A PDF copy of the electronic calendar reminder has been uploaded and attached to the associated corrective action ticket in LabTrack, the laboratory's corrective action system. See LabTrack Ticket # 6323.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	Verification of effectiveness will be completed by confirming that all pipette calibration verifications have been completed within the required frequency during an internal review by QA at the end of each quarter for 2018.
Timetable(s) for Verification:	Expected completion by January 2019. The extended time required for verification of this item is due to the quarterly frequency of the calibration verifications. QA will monitor completion of the verifications each quarter during 2018; however, it is felt that the preventative action needs to prove effective for more than a single instance (quarter) before being considered sufficiently effective to prevent a repeat occurrence.
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6323.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-10 Measurement Traceability a. TNI V1M2-4.13.3.f.vi
Deficiency:	Not all information necessary for the historical reconstruction of data had been maintained by the laboratory, including: Instrumentation identification or reference to such data. For example, records indicated the stopwatch used for autoclave timer checks had not been recorded. In addition, the laboratory must use a NIST traceable timing device.

Corrective Action(s) (CA) to Address the Deficiency:	The laboratory added a note to the most recent timer check to document that the check was performed using The World Clock. Additionally, the laboratory ordered an appropriate NIST traceable timer and will not wait for the next "due date" for the timer check, but will perform an autoclave timer verification immediately upon receipt of the NIST traceable timer.
Timetable(s) for Implementation of CA:	Documentation added to previous records: Completed 6/18/18 Expected Completion for NIST traceable verification: 7/9/18
Means to Document Corrective Action(s):	See Logbook FTW-015, page 13 for documentation of timer used NIST traceable timer will be documented with Certificate of Traceability received with the timer

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory has updated SOP S-DAL-MB-012-rev.03, QC and Maintenance for Microbiology, to specify that The World Clock is not NIST traceable and may not be used for the autoclave timer verifications in section 12.5. In addition, a new form, F-FTW-MB-009-rev.00, Autoclave Timer Verification, has been created to ensure all necessary information is documented each time a verification test is completed. The form also includes specification that the timer used for verification must be NIST traceable. All applicable staff were trained on the revised procedures in SOP S-DAL-MB-012-rev.05 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system. All applicable staff were verbally trained on the new form F-FTW-MB-009-rev.00, Autoclave Timer Verification when the form was implemented, and by follow up email.
Timetable(s) for Implementation of APR:	Both the SOP update and creation of the new form, including verbal training, were Completed 06/29/18. Follow up training email was issued on
Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-MB-012-rev.03, QC and Maintenance for Microbiology and associated training records in the Laboratory Learning Management System (LMS). See Form F-FTW-MB-009-rev.00, Autoclave Timer Verification and training follow up email in the training file of each applicable laboratory personnel.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	The effectiveness of these actions will be confirmed by QA's review of the next timer verification test to ensure that the new form is being used for documentation (F-FTW-MB-009-rev.00) and that the laboratory staff is able to produce documentation that the timer used is NIST traceable (Certificate of Traceability or similar is on file for the timer ordered/used).
Timetable(s) for Verification:	Expected Completion by 7/16/18.
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6324.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-10 Measurement Traceability b. TNI V1M2-4.13.3.f.viii
Deficiency:	Not all information necessary for the historical reconstruction of data had been maintained by the laboratory, including: Analyst's or operator's initials/signature or electronic identification. For example, several data packages for ammonia by SM 4500-NH3 D analysis did not contain the identification of the analyst.

Corrective Action(s) (CA) to Address the Deficiency:	The laboratory notes that the correct method reference for the ammonia analysis performed by the lab is SM 4500-NH3 H; however, acknowledges the deficiency is valid for this method. The laboratory confirmed that the requirement to note analyst initials in the instrument software for each batch is documented in the applicable SOP, S-DAL-I-046-rev.03, Ammonia by FIA. Review of raw data for 2018 indicates that some batches include analyst initials in the raw data and some do not. The analyst was verbally re-trained to document their initials in the instrument software with each batch, and the referenced SOP was re-assigned to them in the laboratory Learning Management System for additional documented training.
Timetable(s) for Implementation of CA:	SOP review and verbal re-training completed 6/15/18 Expected completion for the documented training is 7/6/18.
Means to Document Corrective Action(s):	Electronic sign off by the analyst on the re-assigned SOP, S-DAL-I-046-rev.03 via the laboratory Learning Management System.

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The Data Review Checklist used by the wet chemistry department, F-DAL-Q-040-rev.05 was updated to include confirmation that analyst initials, instrument ID, and method reference are all documented on raw data PDFs for instrumentation analyses that use the laboratory LIMSLINK program for data transfer from the instrument to the LIMS system. (Other analyses utilize the electronic preparation log which auto-fills this information based on user login credentials). QA has reviewed raw data for other applicable analyses and found that data for other instrumentation routinely includes the necessary documentation of analyst initials. However, the Data Review Checklist referenced above, F-DAL-Q-040-rev.05, is utilized for all wet chemistry analyses. The update to this form will therefore also act as a visual reminder for analysts performing any of the applicable LIMSLINK analyses. Training on the updates made to the form was provided to the applicable analysts by QA when the new form was distributed to the laboratory. An email was also issued to the entire wet chemistry department as follow up.
Timetable(s) for Implementation of APR:	Completed 06/28/18, Follow up training email issued 8/29/18.

Means to Document Action(s) to Prevent Recurrence:	See form S-DAL-Q-040-rev.05, Wet Chemistry Data Review Checklist and the follow up training email placed in applicable personnel training files.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	Verification of effectiveness will be performed by QA's review of various randomly selected raw data files for the applicable analyses to confirm that the required information is being routinely included for all methods and by all analysts.
Timetable(s) for Verification:	Expected completion by 8/31/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6325.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-10 Measurement Traceability c. TNI V1M2-4.13.3.f.ix:
Deficiency:	Not all information necessary for the historical reconstruction of data had been maintained by the laboratory, including: Sample preparation, including sample volumes. For example, records indicated 1000 mL of DI water had been routinely used for TSS blanks; however, laboratory staff stated 100 mL of DI water had been used.

Corrective Action(s) (CA) to Address the Deficiency:	Laboratory practice was immediately changed to utilize 1000mL of reagent water for method blanks on 05/01/18, prior to conclusion of the audit; the laboratory has also been updated, SOP S-DAL-I-020-rev.05 was revised to specify use of 1000mL for method blanks in section 12.2.5. All applicable staff were trained on the revised procedures in SOP S-DAL-I-020-rev.05 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system. The laboratory also ran statistical analysis on batch blank data spanning 01/01/17 – 05/01/18 and 05/01/18 – 06/29/18 to determine if the reduced volume for method blanks showed any potential impact to the accuracy of reported blank results. Review of raw data and of statistical analysis performed by North West Analytical Software using raw data pulled from the laboratory LIMS system does not indicate potential impact to reported blank data.
Timetable(s) for Implementation of CA:	SOP Update Completed 6/27/18 Statistical Analysis Completed 6/30/18
Means to Document Corrective Action(s):	See SOP S-DAL-I-020-rev.05 and associated training records in the Laboratory Learning Management System (LMS). See North West Analytical Queries and Charts

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory is reviewing all other technical SOPs to confirm that volume used for batch QC samples is documented. An all staff training is scheduled for July 10th during which time QA will review the deficiencies cited in the audit along with the associated laboratory corrective/preventative actions. Included in this training will be discussion with all staff regarding the requirement for accurate documentation in all aspects of laboratory activity.
Timetable(s) for Implementation of APR:	SOP Reviews Expected Completion 7/31/18 All Staff Training Expected Completion 7/10/18
Means to Document Action(s) to Prevent Recurrence:	SOP Reviews will be documented in QA review Spreadsheet "QC Sample Volume Review" All Staff Training will be documented with Training Attendance Sign Off Form F-DAL-Q-075-rev.00 and associated training Power Point Presentation

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	Effectiveness will be verified by internal audit and observation of laboratory procedures to confirm that changes to procedures are being followed as required and that documentation being produced is accurately reflecting laboratory practices.
Timetable(s) for Verification:	Expected Completion by 7/31/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6326.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-10 Measurement Traceability d. TNI V1M2-4.13.3.f.xi:
Deficiency:	Not all information necessary for the historical reconstruction of data had been maintained by the laboratory, including: Reagent origin, receipt, preparation, and use. For example, the type of COD vial used for analysis had not been specified. Laboratory staff stated only high range COD vials had been used.

Corrective Action(s) (CA) to Address the Deficiency:	The laboratory SOP S-DAL-I-009-rev.04, COD, active at the time of the audit, contained the vial Vendor information including catalog number for the vials used, and all analytical data is traceable to specific vendor lot numbers for the vial used with each sample. This information does allow for traceability of the type of vial used; however, the laboratory acknowledges the benefit to noting the high range vial type directly in the SOP for analyst knowledge and reference. The SOP has therefore been revised (rev.05) to include documentation in section 10.1 that the vials used are high range vials for use with a concentration range of 0-1500ppm, as stated by the manufacturer. All applicable staff were trained on the revised procedures in SOP S-DAL-I-009-rev.04 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system.
Timetable(s) for Implementation of CA:	Completed 6/28/18 (includes SOP training assignment in the LMS)
Means to Document Corrective Action(s):	See SOP S-DAL-I-009-rev.05 and associated training records in the Laboratory Learning Management System (LMS)

Action(s) to Prevent Recurrence (APR) of the Deficiency:	A note was added to the SOP revision history (S-DAL-I-009-rev.05 section 27) to document the reason for making the specified revision and notated not to remove this information or otherwise undo the change in future revisions. All applicable staff were trained on the revised procedures in SOP S-DAL-I-009-rev.04 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system. Other laboratory SOPs will be reviewed for similar instances of vials or other similar materials/supplies designed for use with specific concentration ranges to ensure that there is sufficient detail in the material description.
Timetable(s) for Implementation of APR:	SOP update Completed 06/28/18 (includes SOP training assignment in the LMS) The expected completion date for review of other laboratory SOPs is 10/31/18.
Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-I-009-rev.05 and associated training records in the Laboratory Learning Management System (LMS). Review of other laboratory SOPs for similar instances will be documented within laboratory internal audit records and maintained on the network drive.

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	Verification of effectiveness is not applicable to this corrective/preventative action.
Timetable(s) for Verification:	Completed 06/28/18 - Verification of effectiveness is not applicable to this corrective/preventative action.
Means to Document Verification:	Verification of effectiveness is not applicable to this corrective/preventative action.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-10 Measurement Traceability e. TNI V1M2-4.13.3.f.xix:
Deficiency:	Not all information necessary for the historical reconstruction of data had been maintained by the laboratory, including: A record of names and signatures for all individuals who are responsible for signing laboratory records, such as laboratory reports. The laboratory's Signature Log did not contain electronic signatures. Electronic signatures had been used to sign laboratory reports.

Corrective Action(s) (CA) to Address the Deficiency:	The laboratory has added electronic signatures for all applicable personnel to the laboratory signature logbooks for both the Allen and Fort Worth locations.
Timetable(s) for Implementation of CA:	Completed 06/29/18
Means to Document Corrective Action(s):	See laboratory signature logbooks, DAL-0430 and FTW-009

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory has revised SOP S-DAL-Q-002-rev.03 to include the requirement that electronic signatures, where used, must be included in the laboratory signature logbook in section 12.7.7 All applicable staff were trained on the revised procedures in SOP S-DAL-Q-002-rev.03 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system.
Timetable(s) for Implementation of APR:	Completed 6/25/18
Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-Q-002-rev.03 and associated training records in the Laboratory Learning Management System (LMS)

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	Effectiveness will be verified by QA review of the signature logbook for inclusion of all electronic signatures of all applicable new hires, or newly created electronic signatures for current staff after a period of 60 days.
Timetable(s) for Verification:	Expected Completion by 8/31/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6328.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-11 Reference Standard and Reference Materials TNI V1M2-5.6.4.2:
Deficiency:	Not all records had been maintained on standard preparation including a reference to the date of preparation and expiration date. For example, the assessment team observed spike and LCS standard for cyanide analysis with labels containing expiration dates of 4/21/2018 (LIMS ID #118856 and 118857). Laboratory staff stated the containers contained non-expired spike and LCS preparations and the labels were left over from previous preparations.

Corrective Action(s) (CA) to Address the Deficiency:	The (new) analyst was verbally re-trained and the laboratory updated the associated Standard and Reagent Traceability SOP, S-DAL-Q-025-rev.08, to clearly document in section 12.6, the requirement for standards made daily to be clearly labeled in the same manner as longer lasting standards and for old standard labels to be removed or completely covered. All applicable staff were trained on the revised procedures in SOP S-DAL-Q-025-rev.08 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system.
Timetable(s) for Implementation of CA:	Completed 6/29/18
Means to Document Corrective Action(s):	See SOP S-DAL-Q-025-rev.08 and associated training records in the Laboratory Learning Management System (LMS)

Action(s) to Prevent Recurrence (APR) of the Deficiency:	An all staff training is scheduled for July 10th during which time QA will review the deficiencies cited in the audit along with the associated laboratory corrective/preventative actions. Included in this training will be discussion with all staff regarding the reasons for and need to properly label all standards at all times, even those created daily.
Timetable(s) for Implementation of APR:	Expected Completion 7/10/18
Means to Document Action(s) to Prevent Recurrence:	All Staff Training will be documented with Training Attendance Sign Off Form F-DAL-Q-075-rev.00 and associated training Power Point Presentation

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	

Means to Document Client Notification(s):	N/A

Verification of Effectiveness:	Effectiveness will be verified by incorporating observation and physical/visual review of standards in the laboratory for compliance with labeling procedures in SOP S-DAL-Q-025-rev.08, Standards and Reagent Traceability, during QA's standards traceability audit scheduled as part of the laboratory's annual internal audit schedule.
Timetable(s) for Verification:	Expected Completion 8/31/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6329. Additionally, laboratory internal audit records associated with the referenced Standards and Reagent Traceability audit, as well as records created during future annual audits of this quality system.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-15 Reporting a. TNI V1M2-5.10.3.1.a:
Deficiency:	Not all deviations from, additions to, or exclusions from the test method, were documented on the final report. For example, the fecal coliform by membrane filter method requires the analyst to select a sample volume to yield 20 to 60 colonies per filter. Batch #85016, analyzed 10/10/2017 contained a result and duplicate greater than 60 colonies. A footnote with the data explains the result is greater than 60 colonies per filter and the result is an estimated value. A qualifier explaining this data had not been included on the final report.

Corrective Action(s) (CA) to Address the Deficiency:	The report associated with Batch 85016 was revised and reissued with the appropriate qualifier on the sample and the duplicate. Various other batches for colony count methods analyze between Aug. 2017 and May 2018 were randomly selected and reviewed; other batches found to have notation of colony counts outside method specifications included appropriate documentation/qualification on the final reports. The instance cited in the audit deficiency appears to be an isolated occurrence. The chosen time period reviewed was selected to span changes in staffing within the department late 2017 into early 2018. See spreadsheet "T-15-a_LTT 6330_Batches Reviewed" on the network drive for documentation of other batches reviewed.
Timetable(s) for Implementation of CA:	Completed 6/29/18
Means to Document Corrective Action(s):	See revision of report 7574922, dated 6/29/18 See spreadsheet "T-15-a_LTT 6330_Batches Reviewed" on the network drive for documentation of other batches reviewed.

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory has created a Data Review Checklist specific to the Microbiology department, F-FTW-MB-008-rev.00. Review for appropriate qualifiers, including qualification for colony count ideal ranges, has been included on the checklist. The department was involved in the creation of the checklist, and applicable training on use of the form was performed by QA during this process. No further training is required.
Timetable(s) for Implementation of APR:	Completed 6/29/18
Means to Document Action(s) to Prevent Recurrence:	See form F-FTW-MB-008-rev.00, Micro Data Review Checklist

Client Notification:	☒ N/A.	☐ **Yes. The cited deficiency casts doubt on the validity of results.**

Action(s) for Client Notification:	N/A
Timetable(s) for Client Notification:	N/A
Means to Document Client Notification(s):	N/A

Verification of Effectiveness:	Effectiveness will be verified with ongoing monitoring by QA during routine quarterly raw data audits for inclusion of required qualifiers on final reports.
Timetable(s) for Verification:	Expected completion by 9/30/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6330.

Corrective Action Response for TNI Assessment #:	A18-41
Laboratory:	Pace Analytical Services - Dallas

Finding Number:	T-15 Reporting b. TNI V1M2-5.10.9:
Deficiency:	Revised reports did not contain a reference to the original it replaced. Laboratory management stated, and records indicated, revised reports do not contain a reference to the report it replaced (e.g., revised report #7583886, dated 3/28/2018).

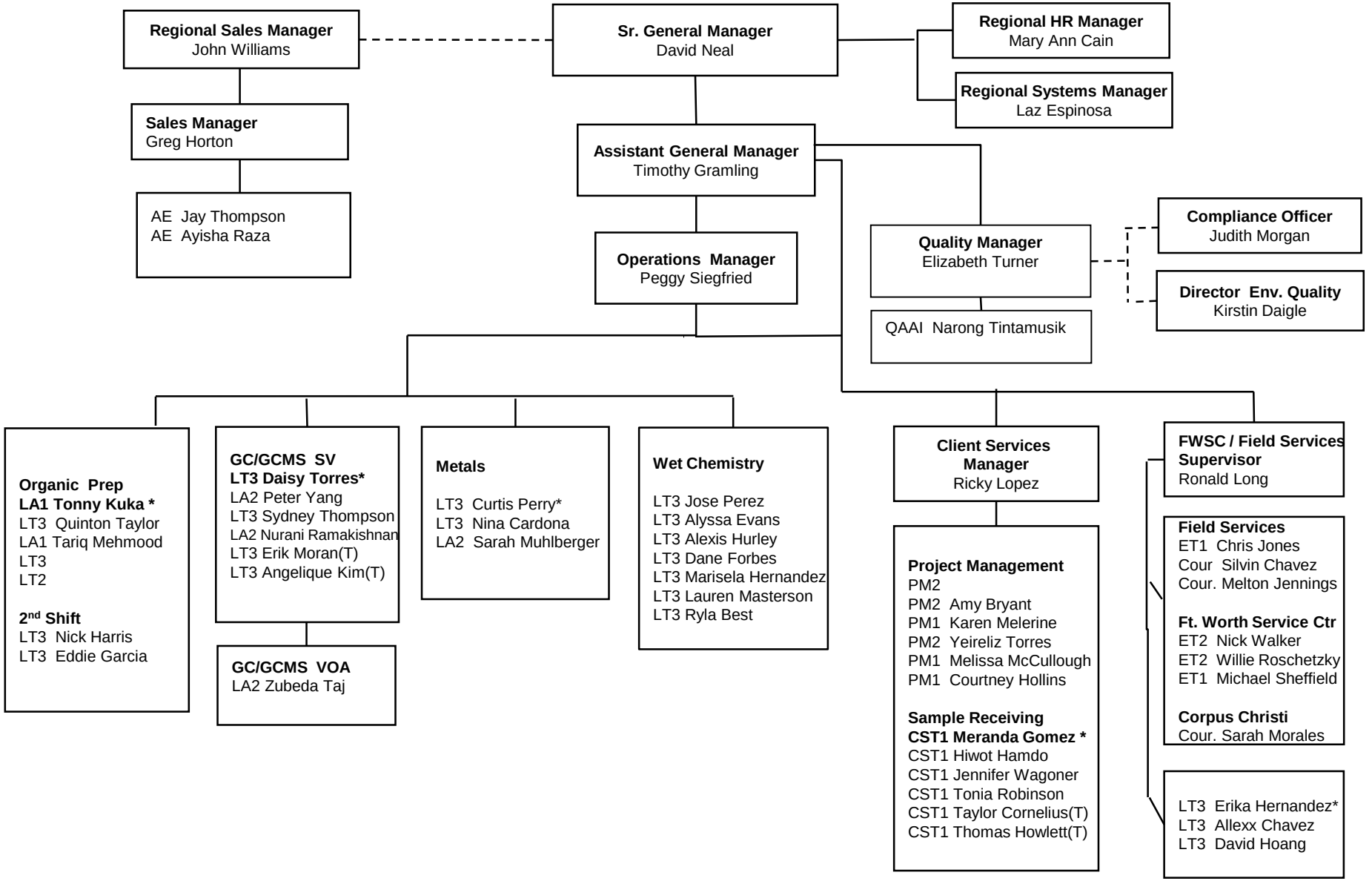
Corrective Action(s) (CA) to Address the Deficiency:	All Project Managers were trained/notified via email from the Client Service Manager of a new format for all revision statements, which includes reference to the report being replaced. (Revised MM/DD/YYYY: reasons for revision, this revision replaces that issued on MM/DD/YYYY.)
Timetable(s) for Implementation of CA:	Completed 5/1/18
Means to Document Corrective Action(s):	See referenced email dated 5/1/18, placed in training files of all applicable personnel

Action(s) to Prevent Recurrence (APR) of the Deficiency:	The laboratory has revised SOP S-DAL-Q-041-rev.01, Final Reports and Deliverables, to include the specified format for all revision statements in section 12.10.2 All applicable staff were trained on the revised procedures in SOP S-DAL-Q-041-rev.01 via the Laboratory Management System (LMS), the laboratory's online training and document sign-off system.
Timetable(s) for Implementation of APR:	Completed 05/01/18
Means to Document Action(s) to Prevent Recurrence:	See SOP S-DAL-Q-041-rev.01, Final Reports and Deliverables, and associated training records in the Laboratory Learning Management System (LMS).

Client Notification:	☒ **N/A.**	☐ **Yes. The cited deficiency casts doubt on the validity of results.**
Action(s) for Client Notification:	N/A	
Timetable(s) for Client Notification:	N/A	
Means to Document Client Notification(s):	N/A	

Verification of Effectiveness:	Effectiveness of these corrective and preventative actions will be verified by QA's confirmation during routine raw data and procedural audits that the applicable changes to documented procedures have been implemented and are being followed in laboratory practice.
Timetable(s) for Verification:	Expected Completion by 7/31/18
Means to Document Verification:	The laboratory Corrective Action System, LabTrack, includes documentation of effectiveness verification. Documentation relating to this particular corrective and preventative action is located in Ticket # 6331.

Pace Analytical Services, LLC -- Dallas



Pace Analytical Services- Dallas

List of Instruments

Instrument	Manufacturer	Model	S/N#	Pace Instrument ID
Organics				
GCMS	Agilent/Archon	6890 (gc)	US00007964	75MSV2
		5973 (ms)	US71410462	
		Archon	15335	
GCMS	Agilent/Archon	6850 (gc)	7361195	75MSV4
		5975 (ms)	CN11042001	
		Archon	US10305001	
GCMS	Agilent/Archon	6890N (gc)	US1022009	75MSV9
		5973 (ms)	US10442855	
		Archon	US11126004	
	Hewlett Packard/Atomx	6890 (gc)	US00007749	75MSV3
		5973 (ms)	M1056 (?)	
		Atomix	US10022002	
	Agilent/EST	7890B (gc)	CN17063204	75MSV6
		5977B (ms)	US1711R012	
		Centurion		
GCMS	Agilent/Teledyne	6890N (gc)	CN10624017	75MSV8
		5975B (ms)	US62713665	
		AQUATek 100 autosampler	US17325006	
		Lumin P&T	US17338003	
GC	Agilent	6890	US00006494	75GCV2
GCMS	Agilent	6890 (gc)	US00008710	75MSS1
		5973 (ms)	US72010560	
GCMS	Agilent	6890 (gc)	US0007972	75MSS2
		5973 (ms)	US71401468	
GCMS	Agilent	6890 (gc)	US00034443	75MSS3
		5973 (ms)	US30944978	
GCMS	Agilent	7890 (gc)	CN13293074	75MSS4
		5977 (ms)	US1328M213	
GCMS	Perkin Elmer	Clarus 600(gc)		75MSS5

Pace Analytical Services- Dallas

List of Instruments

Instrument	Manufacturer	Model	S/N#	Pace Instrument ID
		Clarus 600 S (ms)		
GCMS	Agilent	6890N (gc)	CN10319003	75MSS6
		5973 (ms)	US30945746	
HPLC	Agilent HP1100 Series	Degasser	JP05032387	75LC1
		QuatPump	US53600343	
		ALS	US72102405	
		ColCom	DE14925344	
GC	Agilent	6890N	US00020777	
GC	Agilent	6890	CN1082005	75GCS4
GC	Agilent	6890N	US10335095	75GCS8
GC	Agilent	7890	CN10151020	75GCS9
GC	Agilent	7890	CN10501158	75GCS10
Metals				
ICPMS	Agilent	7700	G3282A	75ICM4
ICP	Thermo	ICAP 6000	ICP-20083606	75ICP1
Mercury	CETAC	M-6100	606501	75HG01
Wet Chemistry				
	Shimadzu	TOC Analyzer	H521050	75WTA9
	Spectronic	Spec 20 4001/4	35GB014035	75WTA3
	Thermo - Dionex	ICS-1600	12080165	75WTA2
	Thermo- Dionex	ICS-1100	14100457	75WTA4
	Lachat	QC8000	010803A410	75WTA5
	Lachat	QC8500	170500002046	75WTAA
	Lachat	QC8500	180600002152	75WTAB
	HACH	HQ40d		75WETA
	Skalar	BOD robot	16287	75WETL
	Therm Sci	Orion Dual Star	LP115134	75WET4
	Thermo Sci	Orion Star A211	X48043	75WETP
	Thermo	Orion 720 At	90907	75WET3
	Oakton	pH 700	2580750	75WETM
	Oakton	COND 6+	2381700	75WET8

Pace Analytical Services- Dallas

List of Instruments

Instrument	Manufacturer	Model	S/N#	Pace Instrument ID
	HACH	2100N	990300005249	75WET7
	Seal	AQ2	90884	75WETN
Organic Prep				
	LabConco		602945	75RV200
	LabConco		258603	75RV199
	Zymark	Turbo Vap II	TV9743R7756	75TV122
	Zymark	Turbo Vap II	TV9806N7960	75TV123
	Zymark	Turbo Vap II	TV9906R8632	75TV155
	Zymark	Turbo Vap II	TV9429N4152	75TV156
	Horizon Technology	Xcel Vap	17-5467	75TV157
	Biotage	Turbo Vap II	TV1709N2185	75TV158
	Biotage	Turbo Vap	181300447	75TV159
	Biotage	Turbo Vap	181300448	75TV160
	Microwave			Mars X
	GPC		J2	75GPC1
	Biotage	103187/07	TV1414N20376	75TV61
	Biotage	**103187/07**	**TV1440N20633**	**75TV62**
	Thermo		SN209695-278	

Pace Analytical Services- Fort Worth

List of Instruments

Instrument	Manufacturer	Model	S/N#	Pace Instrument ID	Analysis
Micro					
Phase Contrast Microscope	Swift	M3300-D	923670H	75WETK	ID of Aquatic Organisms and Phytoplankton
Leica ZOOM 2000 Microscope	Leica	Z45L	1604WN	75WETL	Plate counts
Waterbath	HACH	26PC	05121006	75WB3	FC incubation
Waterbath	Precison Circulation	265	601052425	75WB5	FC incubation back up
Incubator	HACH	153	3030805	75INC2	
Incubator	Thermo Scientific	151030518	42100480	75INC4	
Brown Small Refrigerator	Emerson	OR200	71465378	FTW2	Cultures, reagents & standards
White Small Refrigerator	GE	TAX3DNXARWH	SR107847	FTW1	Media
Light Brown Small Refrigerator	Abscold	AR031M	900300737	FTW4	Media
Quanti-Tray Sealer Model 2	Idexx	89-10894-04	13-023-07793	QT1	TC/EC MPN
Sample Receiving Refrigerator	Norlake Scientific	NSBR331WWG/0	5121054	FTW3	Sample storage
Autoclave	Fisher Scientific	SterilElite24	180823014037	AC4	Sterilization of cultures and water.
pH meter	Thermo Orion Star	Dual Star	EO2164	75WETI	pH of media and buffered water
U.V. Sterilizer	Millipore	Cat. XX6370000		UV Steri-1	Sterilization during all membrane filter methods.
DR 2000/Spectrophotometer	HACH	44800-60	950100033012	75WTA6	Cr+6 and Chlorophyll a
UV-VIS Spectrophotometer Lambda 3B	Perkin Elmer	C618-0437	618N2101302	75WTA7	UV254
Balance, top loader	Ohaus	E400	3130	75BAL7A	
Balance, analytical	Mettler	AB104-S	1120142304	75BAL8A	
Centrifuge	International Equipment Company	Clinical Centrifuge	42835479	CF1	
Overhead stirrer	Wheaton Overhead Stirrer		M10-2329	GRIND1	Chlorophyll-a

Pace Analytical Services- Fort Worth

List of Instruments

Blender	Waring Commercial Blender			BL1	
UVL-56 Handheld UV Lamp	UVP	UVL-56	Sep-11	UVL-1	E.coli
UVL-56 Handheld UV Lamp	UVP	UVL-56	D118653	UVL-2	E.coli
Vacume pump	GAST	DOA-P704-AA	909610629	VP1	All filtration methods
Vacume pump	GAST	DOA-P704-AA	8893	VP2	All filtration methods
Stirring Hot Plate	Thermolyne	SP46925	1069030189435	HP5	Field - stirring purpose
Stirring Hot Plate	Thermo Scientific	SP194715	C1947110836704	HP6	
Stirring Hot Plate	Thermo Scientific	SP194715	C1947101137100	HP7	
Filter Dispenser	EZ-Pak Millipore	EZDISP001	001797	FD1	

Pace Analytical®

DALLAS LABORATORY SERVICES

Providing Environmental and Specialty Analytical Testing for Texas.

PACE ANALYTICAL'S DALLAS, LABORATORY

Pace Analytical's Dallas, TX, laboratory is a full-service environmental testing facility that offers a wide array of analytical capabilities, services and support. The Dallas laboratory personnel have extensive experience in the analysis of organic, inorganic and general chemistry with a variety of sample matrices that are accepted USEPA, RCRA and Standard Methods.

For 39 years, Pace laboratories have exceeded clients' expectations by providing sound environmental science, unsurpassed testing and reliable data quality. Today, Pace continues its commitment to exceptional customer service and project management support.

NELAP ACCREDITATION

The Dallas laboratory, as with nearly all Pace laboratories, holds a National Environmental Laboratory Accreditation Program (NELAP) accreditation which is granted by various state agencies. This means that the laboratory meets significant, strictly defined, laboratory quality standards that are based on an international system and is able to consistently provide reliable, legally defensible data to regulators and customers.

ENVIRONMENTAL | DALLAS LABORATORY

ANALYTICAL LABORATORY TESTING

Comprehensive Capabilities

Pace Analytical Dallas Laboratory services include the analysis of inorganic, organic and bacteriological parameters to address the Clean Water Act, RCRA, Hazardous Waste, Underground Storage Tank, Pretreatment, Toxic Substance Control Act, Storm Water Discharge, Safe Drinking Water Act, Texas Risk Reduction Program (TRRP) and other regulatory testing and monitoring requirements. Some of the customary groups of analyses performed to satisfy these regulations include:

- Priority Pollutants
- Skinner List
- Wastewater
- BTEX/TPH/MTBE
- TPDES
- SPLP
- Groundwater Quality
- Table II, III, IV & V
- Waste Profiles
- TCLP
- Groundwater Contamination
- NPDES

Wastewater Capabilities:

The Dallas laboratory has many years of experience in performing wastewater sample collection and analysis on influent, effluent and industrial pretreatment. We follow EPA approved procedures such as those set forth in 40 CFR part 136 "Guidelines Establishing Test Procedures for Analysis of Pollutants" under the Clean Water Act. The Dallas laboratory is the only NELAP accredited laboratory in North Texas that can perform the entire TPDES Permit Renewal in-house and without the use of outside subcontract laboratories.

Waste Characterization:

The Dallas laboratory is also experienced with waste characterization analyses for all types of matrices. The facility offers both TCLP and SPLP analyses and has experience in performing Universal Treatment Standards (UTS) analyses for chemical and petroleum industries.

Meeting Your Business Needs:

To complement our services, we also offer the following:

Convenient sample pickup
Customized bottle orders
Data packages
Online data management (PacePort)
Preprinted labels
Preprinted Chain of Custody

Fixed Laboratory Capabilities:

Inorganics
- Trace Metals
- General Chemistry

Organics
- GC & GC/MS Volatiles
- GC & GC/MS Semi-volatiles

Electronic Data Reporting

Industry Expertise:

Petroleum Refining
Chemical Manufacturing
Petroleum Retailer
Pipeline and Distribution
Waste Management
Utilities
Transportation
Pharmaceutical

Defensible Analytical Data:

Pace Analytical's Dallas laboratory has always provided accurate, defensible data—data in which important environmental decisions can be made. Validatable report packages for SW-846 methods are available, which allow for complete data review beyond the standard commercial reporting format.

Certifications: NELAP

Arkansas
Florida
Iowa
Kansas
Louisiana
Oklahoma
Texas

Protocols/Regulatory Systems:

Clean Water Act
CERCLA
Resource Conservation & Recovery Act
Safe Drinking Water Act

Major Instrumentation:

11 Gas Chromatographs
7 GC/MS Systems
1 ICP-MS
1 Mercury Analyzers
1 TOC Analyzer
2 IC Analyzer
1 HPLC
2 Lachat

Personnel Overview:

Number of Personnel - 50
Technical Personnel - 40
Support Personnel - 10
BS/BA - 42
Advanced Degrees - 1

Courier Service:

Courier service is provided for sample pickups or container deliveries. Depending on project scope, arrangements can be made for courier services beyond the regular route.

Custom bottle kits, preprinted labels and preprinted Chain of Custody are provided.

For more information, contact:

Greg Horton | 972.837.7937
Ayisha Raza | 972.358.6064
Jay Thompson | 469.207.0804
Fort Worth Service Center | 817.335.1186

Pace Analytical®

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Corporate Headquarters
1800 Elm Street SE
Minneapolis, MN 55414
P: 612.607.6400
www.pacelabs.com

Data Reporting Capabilities

Web-based Report Access - PacePort

Pace Analytical has developed an Internet site called PacePort that allows clients of any Pace Analytical laboratory to view, download and print analytical reports and invoices. PacePort is a secured site, utilizing individual log-on ID's and passwords. Data is encrypted between the client's browser and the download site. Reports and invoices are posted on the site in Adobe® PDF format and remain available online for several years.

PacePort is a web-based data-management tool designed specifically for our customers. With up-to-the-hour data access from your computer, you have a quick resource to the information you need – when you need it.

- Quick, easy and secure access to your data – 24/7
- Confirm sample receipt and methods requested
- Check status of samples or projects at the lab
- Provide added value to your clients and projects
- Generate custom Electronic Data Deliverables (EDD)
- Order your containers online
- Improve your data/report management efficiency
- Put watches on critical projects to receive email notifications of results
- Select type of notifications that you want to receive
- Work on deadlines during non-business hours
- Archive all historical site/project data and reports
- Share data access with all interested stakeholders

PacePort can be accessed via the Pace Analytical Website: **www.pacelabs.com**. To begin using PacePort, clients must first register to obtain their user ID and password. A Pace Analytical project manager will assist the client in setup an account to access their reports on PacePort. For more information, please contact your Pace Analytical Project Manager.

LIMS / Instrument Automation / EDDS

Pace Analytical has invested heavily in systems automation and electronic communications in order to enhance our turnaround time and service quality. These investments in technology were made because we believe that if we communicate to you more efficiently, you will spend less time and effort understanding and utilizing the analytical data that we provide. Our information systems support our Client Services, Accounting and Laboratory Operations. The entire network of Pace Analytical laboratories is integrated, allowing real-time sharing of information between our facilities and between the departments within those facilities.

LIMS *(Laboratory Information Management Systems)*

Pace Analytical has implemented a LIMS, called EPIC Pro (Environmental Project and Information Control), which has been custom-designed for Pace Analytical and the specific needs of environmental laboratory operations. It is based on an Oracle relational database, giving the system the flexibility to adapt to many of your specific project and reporting requirements. From sample check-in to invoicing, EPIC Pro models the

laboratory operations, eliminating redundant processes and data entry, and allowing for greater standardization in areas such as quality control batching, data reporting, and billing throughout the Pace Analytical system. As well as having a common LIMS, the Pace Analytical laboratories are linked via a high-speed network, which allows for transparent information transfer.

LIMS General Capabilities:

Project Definition/Sample Pre-check-in: This feature allows a Pace Analytical project manager to load into the LIMS most of the information that sample check-in will need at the time of sample receipt allowing for a faster log-in proves..

Sample Check-in: All samples delivered to Pace Analytical's sample coordinator are entered into the LIMS and organized by project number. All relevant project information accompanying samples is entered into the system at sample check-in, unless the project was "pre-defined," such as client name, client number, project name, project description, sample matrix, analytical method, QC level, due date, etc.

Scheduling: Each day, Pace Analytical department managers check on-line or receive computer reports listing those projects which are still open within each analytical area. Based on these reports, managers set priorities and schedule work appropriately to meet the project needs.

Project Management: Pace Analytical has established a separate client services area to manage all project aspects. An important element of this function is to coordinate the compilation of data on projects involving analyses over multiple locations. Other important functions of this area are to maintain client liaison, expedite report delivery, help laboratory managers schedule work, etc. For large project commitments, Pace Analytical designates a specific Project or Program Manager. Project Managers find the LIMS to be an effective tool for achieving project schedules, budgets and objectives, and maintaining client satisfaction.

Data Entry: All data generated within each analytical area are entered or uploaded into the computer system according to project number. The data is not entered until all quality assurance/quality control checks have been made. Project management/client services staff routinely review outstanding projects to make sure appropriate progress is being made on the completion of required analyses.

Data Reporting: When all analyses have been completed and entered, a draft final report is generated from the LIMS. The draft final report is reviewed by all appropriate management staff whose analytical areas have been involved on that project. Upon review, any corrections are made before issuing a final report, which is sent out to the client. In addition to the hard copy, the report, or the report data, can be copied onto a CD, Adobe Acrobat format via e-mail, diskette, CD or download from the Internet.

Management Information: The LIMS also provides information concerning the numbers of samples analyzed, the number of specific analyses performed, holding time status, and other information is used by Pace Analytical management to track capacity, efficiency and productivity and, ultimately, the need to add capacity.

Invoicing: Automated invoicing is accomplished at the time of project initiation or by the input of pricing information during sample/project entry.

Instrument Upload

Pace Analytical laboratories also utilize various forms generation software packages. These software packages allow for automated routing of instrument-generated data directly into processors that will develop complex data deliverable packages. This helps to provide a consistent deliverable package to our clients. Pace Analytical has also invested significant resources in automating the results upload process from our instruments directly into the LIMS system. This automatic upload eliminates the potential for transcription error and helps us meet shorter turn-around time requests from our clients.

Most of our laboratories have implemented Thermo's Target Software for Windows to automate our organic laboratories. Many laboratories also utilize Labtronics LIMSLINK software to automate the upload of results from metals instruments. These systems provide Pace Analytical staff with a significant reduction in data processing time, and eliminate transcription and related errors. It also facilitates the productions of "CLP-like" forms and electronic data deliverables.

Electronic Communications

Email: Pace Analytical's email system, installed in all our laboratories and our corporate office, allows us to communicate to our clients via the Internet. All Pace Analytical employees can be reached via the following protocol: firstname.lastname@pacelabs.com.

Electronic Delivery of Results: Pace Analytical offers our clients the electronic delivery of results in a number of different ways. Electronic results are available from our Website through PacePort, on CD or via e-mail. PacePort allows clients to view, download and print analytical reports and invoices. The standard format for these files is Adobe® PDF; however, other formats such as ASCII-delimited, CSV, or Excel spreadsheets are available.

EDI: Pace Analytical currently is set up to allow our clients to pay our invoices in an electronic fashion, with electronic payments being accepted directly into our bank account. In addition, we have EDI communications with some clients.

Novell Network Using VPN Technology: Our Corporate IT staff maintains a Novell network that allows Pace Analytical to efficiently share information between all locations. This network supports our internal e-mail system, the Pace Analytical intranet, and allows for the sharing of analytical project information and financial information.

Pace Analytical

400 W. Bethany, Suite 190
Allen, TX 75013

List of Representative Customers Requiring Similar Services

Customer	Phone Number Contact
NORTH TEXAS MUNICIPAL WATER DIST. PO Box 2408 Wylie, Texas 75098	(972) 442-5405 Ray Cotton
TRINITY RIVER AUTHORITY 6500 W Singleton Dallas, Texas 75212	(972) 263-2251 Criag Harvey
CITY OF DALLAS 1020 Sargent Road Dallas, Texas 75203	(214) 243-2354 Joseph Fielding

CONFIDENTIAL

Pace Analytical®	Document Name: Quality Assurance Manual	Document Revised: March 6, 2017 Effective Date of Final Signature Page 1 of 86
	Document No.: Quality Assurance Manual rev.19.0	Issuing Authorities: Pace Dallas Quality Office

QUALITY ASSURANCE MANUAL

Quality Assurance/Quality Control Policies and Procedures

Pace Analytical Services, LLC – Dallas, TX
400 W. Bethany Dr., Suite 190; Allen, TX 75013; 972-727-1123

APPROVAL

Chris Parsons — 04/27/17
Chris Parsons
Laboratory General Manager
972-727-1123
Date

Peggy Siegfried — 04/26/17
Peggy Siegfried
Laboratory Quality Manager
972-727-1123
Date

Melissa Garcia — 4/26/17
Melissa Garcia
Laboratory Technical Director, Inorganics
972-727-1123
Date

Ben Messay — 04/27/17
Ben Messay
Laboratory Technical Director, Organics
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Date

Deanna Lytle — 04/27/17
Deanna Lytle
Laboratory Technical Director, Microbiology
817-335-1186
Date

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1.0. INTRODUCTION AND ORGANIZATIONAL STRUCTURE

"Working together to protect our environment and improve our health"
Pace Analytical Services LLC - Mission Statement

1.1. Introduction to Pace

1.1.1. Pace Analytical Services, LLC is a privately held, full-service analytical testing firm operating a nationwide system of laboratories. Pace offers extensive services beyond standard analytical testing, including: bioassay for aquatic toxicity, air toxics, dioxins and coplanar PCB's by high resolution mass spectroscopy, radiochemical analyses, product testing, pharmaceutical testing, field services and mobile laboratory capabilities. This document defines the Quality System and Quality Assurance (QA)/Quality Control (QC) protocols.

1.1.2. Pace laboratories are capable of analyzing a full range of environmental samples from a variety of matrices, including air, surface water, wastewater, groundwater, soil, sediment, biota, and other waste products. Methods are applied from regulatory and professional sources including EPA, ASTM, USGS, NIOSH, Standard Methods, and State Agencies. Section 11 of this document is a representative listing of general analytical protocol references.

1.2. Statement of Purpose

1.2.1. To meet the business needs of our customers for high quality, cost-effective analytical measurements and services.

1.3. Quality Policy Statement and Goals of the Quality System

1.3.1. Pace management is committed to maintaining the highest possible standard of service and quality for our customers by following a documented quality system that is compliant with all current applicable state, federal, and industry standards, such as the NELAC Standard, the TNI Standard, and ISO standards and is in accordance with the stated methods and customer requirements. The overall objective of this quality system is to provide reliable data of known quality through adherence to rigorous quality assurance policies and quality control procedures as documented in this Quality Assurance Manual.

1.3.2. All personnel within the Pace network are required to be familiar with all facets of the quality system relevant to their position and implement these policies and procedures in their daily work.

1.4. Core Values

1.4.1. The following are the Pace Core Values:

- **Integrity**
- **Value Employees**
- **Know Our Customers**
- **Honor Commitments**

- **Flexible Response To Demand**
- **Pursue Opportunities**
- **Continuously Improve**

1.5. Code of Ethics and Standards of Conduct

1.5.1. **Code of Ethics**:

1.5.1.1. Each Pace employee is responsible for the propriety and consequences of his or her actions;

1.5.1.2. Each Pace employee must conduct all aspects of Company business in an ethical and strictly legal manner, and must obey the laws of the United States and of all localities, states and nations where Pace does business or seeks to do business;

1.5.1.3. Each Pace employee must reflect the highest standards of honesty, integrity and fairness on behalf of the Company with customers, suppliers, the public, and one another.

1.5.1.4. Each Pace employee must recognize and understand that our daily activities in environmental laboratories affect public health as well as the environment and that environmental laboratory analysts are a critical part of the system society depends upon to improve and guard our natural resources:

1.5.2. **Standards of Conduct:**

1.5.2.1. **Data Integrity**

1.5.2.1.1. The accuracy and integrity of the analytical results and its supporting documentation produced at Pace are the cornerstones of the company. Employees are to accurately prepare and maintain all technical records, scientific notebooks, calculations, and databases. Employees are prohibited from making false entries or misrepresentations of data for any reason.

1.5.2.1.2. Managerial staff must make every effort to ensure that personnel are free from any undue pressures that may affect the quality or integrity of their work including commercial, financial, over-scheduling, and working condition pressures.

1.5.2.1.3. The data integrity system includes in-depth, periodic monitoring of data integrity including peer data review and validation, internal raw data audits, proficiency testing studies, etc.

1.5.2.1.4. Any documentation related to data integrity issues, including any disciplinary actions involved, corrective actions taken, and notifications to customers must be retained for a minimum of five years.

1.5.2.2. **Confidentiality**

1.5.2.2.1. Pace employees must not use or disclose confidential or proprietary information except when in connection with their duties at Pace. This is effective over the course of employment and for an additional period of two years thereafter.

1.5.2.2.2. Confidential or proprietary information, belonging to either Pace and/or its customers, includes but is not limited to test results, trade secrets, research and development

matters, procedures, methods, processes and standards, company-specific techniques and equipment, marketing and customer information, inventions, materials composition, etc.

1.5.2.3. **Conflict of Interest**

1.5.2.3.1. Pace employees must avoid situations that might involve a conflict of interest or could appear questionable to others. This includes participation in activities that conflict or appear to conflict with the employees' Pace responsibilities. This would also include offering or accepting anything that might influence the recipient or cause another person to believe that the recipient may be influenced to behave or in a different manner than he would normally (such as bribes, gifts, kickbacks, or illegal payments).

1.5.2.3.2. Employees are not to engage in outside business or economic activity relating to a sale or purchase by the Company. Other problematic activities include service on the Board of Directors of a competing or supplier company, significant ownership in a competing or supplier company, employment for a competing or supplier company, or participation in any outside business during the employee's work hours.

1.5.3. Strict adherence by each Pace employee to this Code of Ethics and to the Standards of Conduct is essential to the continued vitality of Pace and to continue the pursuit of our common mission to protect our environment and improve our health.

1.5.4. Failure to comply with the Code of Ethics and Standards of Conduct will result in disciplinary action up to and including termination and referral for civil or criminal prosecution where appropriate. An employee will be notified of an infraction and given an opportunity to explain, as prescribed under current disciplinary procedures.

1.5.5. Compliance: all employees undergo annual Data Integrity/Ethics training which includes the concepts listed above. All employees also sign an annual Ethic Policy statement.

1.6. Anonymous Compliance Alertline

1.6.1. An ethical and safe workplace is important to the long-term success of Pace and the well-being of its employees. Pace has a responsibility to provide a work environmental where employees feel safe and can report unethical or improper behavior in complete confidence. With this in mind, Pace has engaged Lighthouse Services, Inc. to provide all employees with access to an anonymous ethics and compliance alertline for reporting possible ethics and compliance violations. The purpose of this service is to ensure that any employee can report anonymously and without fear of retaliation.

1.6.2. Lighthouse Services provides a toll-free number along with several other reporting methods, all of which are available 24 hours a day, seven days a week for use by employees and staff.

1.6.3. Telephone: English speaking USA and Canada: (844)-970-0003.

1.6.4. Telephone: Spanish speaking North America: (800)-216-1288.

1.6.5. Website: www.lighthouse-services.com/pacelabs.

1.6.6. Email: reports@lighthouse-services.com (must include company name with report).

1.7. Laboratory Organization

1.7.1. Each laboratory within the system operates with local management, but all labs share common systems and receive support from the Corporate Office. See Attachment III for the Corporate Organizational structure.

1.7.2. A Senior General Manager (SGM) oversees all laboratories and service centers in their assigned region. Each laboratory or facility in the company is then directly managed by an SGM, a General Manager (GM), an Assistant General Manager (AGM), or an Operations Manager (OM). Quality Managers (QM) or Senior Quality Managers (SQM) at each laboratory report directly to the highest level of local laboratory management, however named, that routinely makes day-to-day decisions regarding that facility's operations. The QMs and SQMs will also receive guidance and direction from the corporate Director of Environmental Quality.

1.7.3. The SGM, GM, AGM or OM, or equivalent functionality in each facility, bears the responsibility for the laboratory operations and serves as the final, local authority in all matters. In the absence of these managers, the SQM/QM serves as the next in command, unless the manager in charge has assigned another designee. He or she assumes the responsibilities of the manager, however named, until the manager is available to resume the duties of their position. In the absence of both the manager and the SQM/QM, management responsibility of the laboratory is passed to the Technical Director, provided such a position is identified, and then to the most senior department manager until the return of the lab manager or SQM/QM. The most senior department manager in charge may include the Client Services Manager (CSM) or the Administrative Business Manager (ABM) at the discretion of the SGM/GM/AGM/OM.

1.7.4. A Technical Director who is absent for a period of time exceeding 15 consecutive calendar days shall designate another full-time staff member meeting the qualifications of the technical director to temporarily perform this function. The laboratory SGM/GM/AGM/OM or SQM/QM has the authority to make this designation in the event the existing Technical Director is unable to do so. If this absence exceeds 35 consecutive calendar days, the primary accrediting authority shall be notified in writing.

1.7.5. The SQM/QM has the responsibility and authority to ensure the Quality System is implemented and followed at all times. In circumstances where a laboratory is not meeting the established level of quality or following the policies set forth in this Quality Assurance Manual, the SQM/QM has the authority to halt laboratory operations should he or she deem such an action necessary. The SQM/QM will immediately communicate the halting of operations to the SGM/GM/AGM/OM and keep them posted on the progress of corrective actions. In the event the SGM/GM/AGM/OM and the SQM/QM are not in agreement as to the need for the suspension, the Chief Operating Officer (COO) and Director of Environmental Quality will be called in to mediate the situation.

1.7.6. The lab is required to appoint deputies for key managerial personnel. These deputies must be documented for auditing purposes. The deputies, by position, are the following:

1.7.6.1. Deputy for General Manager is the Organics Technical Director.

1.7.6.2. Deputy for Organics Technical Director is the General Manager.

1.7.6.3. Deputy for Inorganics Technical Director is the General Manager.

1.7.6.4. Deputy for the Microbiology Technical Director is the Secondary Microbiology Analyst.

1.7.6.5. Deputy for Quality Manager is the General Manager.

1.7.6.6. Deputy for Client Services Manager is the most Senior Project Manager.

1.7.6.7. Deputy for Administrative Business Manager is Corporate Human Resources.

1.7.6.8. Deputy for Project Managers is the Client Service Manager.

1.7.7. The technical staff of the laboratory is generally organized into the following functional groups:

- Organic Sample Preparation
- Wet Chemistry Analysis
- Metals Analysis
- Volatiles Analysis
- Semi-volatiles Analysis
- Radiochemical Analysis
- Microbiological Analysis
- Bioassay Analysis

1.7.8. The organizational structure for Pace – Dallas is listed in Attachment II. In the event of a change in SGM/GM/AGM/OM, SQM/QM, or any Technical Director, the laboratory will notify its accrediting authorities per their individual required timeframes, not to exceed 30 days. The QAM will remain in effect until the next scheduled revision.

1.8. Laboratory Job Descriptions

1.8.1. Senior General Manager

- Oversees all functions of all the operations within their designated region;
- Oversees the development of local GMs/AGMs/OMs within their designated region;
- Oversees and authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Oversees the preparation of budgets and staffing plans for all operations within their designated region;
- Ensures compliance with all applicable state, federal and industry standards;
- Works closely with Regional Sales Management.

1.8.2. General Manager

- Oversees all functions of their assigned operations;
- Authorizes personnel development including staffing, recruiting, training, workload scheduling, employee retention and motivation;
- Prepares budgets and staffing plans;
- Monitors the Quality Systems of the laboratory and advises the SQM/QM accordingly;
- Presents the Ethics/Data Integrity training annually to all employees in their facilities as an instructor-led training.
- Ensures compliance with all applicable state, federal and industry standards.

1.8.4. Quality Manager

- Responsible for implementing, maintaining and improving the quality system while functioning independently from laboratory operations. Reports directly to the highest level of local laboratory facility management, however named, that routinely makes day-to-day decisions

regarding laboratory operations, but receives direction and assistance from the Corporate Director of Environmental Quality. They may also report to a Senior Quality Manager (SQM);

- Ensures that communication takes place at all levels within the lab regarding the effectiveness of the quality system and that all personnel understand their contributions to the quality system;
- Monitors QA/QC activities to ensure that the laboratory achieves established standards of quality (as set forth by the Corporate Environmental Quality office). The QM is responsible for reporting the lab's level of compliance to these standards to the Corporate Director of Environmental Quality on a quarterly basis;
- Maintains records of quality control data and evaluates data quality;
- Conducts periodic internal audits and coordinates external audits performed by regulatory agencies or customer representatives;
- Reviews and maintains records of proficiency testing results;
- Maintains the document control system;
- Assists in development and implementation of appropriate training programs;
- Provides technical support to laboratory operations regarding methodology and project QA/QC requirements;
- Maintains certifications from federal and state programs;
- Ensures compliance with all applicable state, federal and industry standards;
- Maintains the laboratory training records, including those in the Learning Management System (LMS), and evaluates the effectiveness of training;
- Monitors corrective and preventive actions;
- Maintains the currency of the Quality Manual.

1.8.5. Technical Director

- Monitors the standards of performance in quality assurance and quality control data;
- Monitors the validity of analyses performed and data generated;
- Reviews tenders, contracts and QAPPs to ensure the laboratory can meet the data quality objectives for any given project;
- Serves as the manager of the laboratory in the absence of the SGM/GM/AGM/OM and SQM/QM;
- Provides technical guidance in the review, development, and validation of new methodologies.

1.8.6. Administrative Business Manager

- Responsible for financial and administrative management for the entire facility;
- Provides input relative to tactical and strategic planning activities;
- Organizes financial information so that the facility is run as a fiscally responsible business;
- Works with staff to confirm that appropriate processes are put in place to track revenues and expenses;
- Provide ongoing financial information to the SGM/GM/AGM/OM and the management team so they can better manage their business;
- Utilizes historical information and trends to accurately forecast future financial positions;
- Works with management to ensure that key measurements are put in place to be utilized for trend analysis—this will include personnel and supply expenses, and key revenue and expense ratios;

- Works with SGM/GM/AGM/OM to develop accurate budget and track on an ongoing basis;
- Works with entire management team to submit complete and justified capital budget requests and to balance requests across departments;
- Works with project management team and administrative support staff to ensure timely and accurate invoicing.

1.8.7. Client Services Manager

- Oversees all the day to day activities of the Client Services Department which includes Project Management and, possibly, Sample Control;
- Responsible for staffing and all personnel management related issues for Client Services;
- Serves as the primary senior consultant to customers on all project related issues such as set up, initiation, execution and closure;
- Performs or is capable of performing all duties listed for that of Project Manager.

1.8.8. Project Manager

- Coordinates daily activities including taking orders, reporting data and analytical results;
- Serves as the primary technical and administrative liaison between customers and Pace;
- Communicates with operations staff to update and set project priorities;
- Provides results to customers in the requested format (verbal, hardcopy, electronic, etc.);
- Works with customers, laboratory staff, and other appropriate Pace staff to develop project statements of work or resolve problems of data quality;
- Responsible for solicitation of work requests, assisting with proposal preparation and project initiation with customers and maintain customer records;
- Mediation of project schedules and scope of work through communication with internal resources and management;
- Responsible for preparing routine and non-routine quotations, reports and technical papers;
- Interfaces between customers and management personnel to achieve customer satisfaction;
- Manages large-scale complex projects;
- Supervises less experienced project managers and provide guidance on management of complex projects;
- Arranges bottle orders and shipment of sample kits to customers;
- Verifies login information relative to project requirements and field sample Chains-of-Custody.

1.8.9. Department Manager/Supervisor

- Oversees the day-to-day production and quality activities of their assigned department;
- Ensures that quality assurance and quality control criteria of analytical methods and projects are satisfied;
- Assesses data quality and takes corrective action when necessary;
- Approves and releases technical and data management reports;
- Ensures compliance with all applicable state, federal and industry standards.

1.8.10. Additional job descriptions are available upon request from the laboratory ABM.

1.9. Training and Orientation

1.9.1. Training for Pace employees is managed through a web-based training system. Employees are provided with several training activities for their particular job description and scope of duties. These training activities may include:

- Hands-on training led by supervisors;
- Job-specific training checklists and worksheets;
- Lectures and instructor-led training sessions;
- Method-specific training;
- External conferences and seminars;
- Reading Standard Operating Procedures (SOPs);
- Reading the Quality Assurance Manual and Safety Manual/Chemical Hygiene Plan;
- Core training modules (basic lab skills, etc.);
- Quality system training modules (support equipment use, corrective actions/root causes, etc.);
- Data Integrity/Ethics training;
- Specialized training by instrument manufacturers;
- On-line courses.

1.9.2. All procedures and training records are maintained and available for review during laboratory audits. Additional information can be found in SOP S-ALL-Q-020 **Training and Employee Orientation** or its equivalent revision or replacement.

1.10. Laboratory Safety and Waste

1.10.1. It is the policy of Pace to make safety and waste compliance an integral part of daily operations and to ensure that all employees are provided with safe working conditions, personal protective equipment, and requisite training to do their work without injury. Each employee is responsible for his/her own safety as well as those working in the immediate area by complying with established company rules and procedures. These rules and procedures as well as a more detailed description of the employees' responsibilities are contained in the local Safety Manual/Chemical Hygiene Plan.

1.11. Security and Confidentiality

1.11.1. Security is maintained by controlled access to laboratory buildings. Exterior doors to laboratory buildings remain either locked or continuously monitored by Pace staff.

1.11.2. Additional security is provided where necessary, (e.g., specific secure areas for sample, data, and customer report storage), as requested by customers, or cases where national security is of concern. These areas are lockable within the facilities, or are securely offsite. Access is limited to specific individuals or their designees.

1.11.3. All information pertaining to a particular customer, including national security concerns will remain confidential. Data will be released to outside agencies only with written authorization from the customer or where federal or state law requires the company to do so.

1.12. Communications

1.12.1. Management within each lab bears the responsibility of ensuring that appropriate communication processes are established and that communication takes place regarding the effectiveness of the management/quality system. These communication processes may include email, regular staff meetings, senior management meetings, etc.

1.12.2. Corporate management bears the responsibility of ensuring that appropriate communication processes are established within the network of facilities and that communication takes place at a company-wide level regarding the effectiveness of the management/quality systems of all Pace facilities. These communication processes may include email, quarterly continuous improvement conference calls for all lab departments, and annual continuous improvement meetings for all department supervisors, quality managers, client services managers, and other support positions.

2.0. SAMPLE CUSTODY

2.1. Project Initiation

2.1.1. Prior to accepting new work, the laboratory reviews its performance capability. The laboratory confirms that sufficient personnel, equipment capacity, analytical method capability, etc., are available to complete the required work. Customer needs, certification requirements, and data quality objectives are defined and the appropriate sampling and analysis plan is developed to meet the project requirements by project managers or sales representatives. Members of the management staff review current instrument capacity, personnel availability and training, analytical procedures capability, and projected sample load. Management then informs the sales and client services personnel whether or not the laboratory can accept the new project via written correspondence, email, and/or daily operations meetings.

2.1.2. Additional information regarding specific procedures for reviewing new work requests can be found in SOP S-DAL-C-006 **Review of Analytical Requests** or its equivalent revision or replacement.

2.2. Sampling Materials and Support

2.2.1. Each individual Pace laboratory provides shipping containers, properly preserved sample containers, custody documents, and field quality control samples to support field-sampling events. Guidelines for sample container types, preservatives, and holding times for a variety of methods are listed in Attachment VII. Note that all analyses listed are not necessarily performed at all Pace laboratories and there may be additional laboratory analyses performed that are not included in these tables. Customers are encouraged to contact their local Pace Project Manager for questions or clarifications regarding sample handling. Pace may provide pick-up and delivery services to their customers when needed

2.2.2. Some Pace facilities provide sampling support through a Field Services department. Field Services operates under the Pace Corporate Quality System, with applicable and necessary provisions to address the activities, methods, and goals specific to Field Services. All procedures and methods used by Field Services are documented in SOPs and Procedure Manuals.

2.3. Chain of Custody

2.3.1. A chain of custody (COC) provides the legal documentation of samples from time of collection to completion of analysis.

2.3.2. Field personnel or client representatives must complete a COC for all samples that are received by the laboratory. Samplers are required to properly complete a COC. This is critical to efficient sample receipt and to ensure the requested methods are used to analyze the correct samples. If sample shipments are not accompanied by the correct documentation, the Sample Receiving department notifies a Project Manager. The Project Manager then obtains the correct documentation/information from the customer in order for analysis of samples to proceed.

2.3.3. The COC is filled out completely and legibly with indelible ink. Errors are corrected by drawing a single line through the initial entry and initialing and dating the change. All transfers of samples are

recorded on the chain of custody in the "relinquished" and "received by" sections. All information except signatures is printed.

2.3.4. Additional information can be found in SOP S-DAL-C-001 **Sample Management** or its equivalent revision or replacement.

2.4. Sample Acceptance Policy

2.4.1. In accordance with regulatory guidelines, Pace complies with the following sample acceptance policy for all samples received.

2.4.2. If the samples do not meet the sample receipt acceptance criteria outlined below, the laboratory is required to document all non-compliances, contact the customer, and either reject the samples or fully document any decisions to proceed with analyses of samples which do not meet the criteria. Any results reported from samples not meeting these criteria are appropriately communicated to the client.

2.4.3. Sample Acceptance Policy requirements:

- Sample containers must have unique client identification designations that are clearly marked with indelible ink on durable, water-resistant labels. The client identifications must match those on the chain-of-custody (COC).
- There must be clear documentation on the COC, or related documents, that lists the unique sample identification, sampling site location, date and time of sample collection, and name of the sample collector.
- There must be clear documentation on the COC, or related documents, that lists the requested analyses, the preservatives used, and any special remarks concerning the samples (i.e., data deliverables, samples are for evidentiary purposes, field filtration, etc.).
- Samples must be in appropriate sample containers. If the sample containers show signs of damage (i.e., broken or leaking) or if the samples show signs of contamination, the samples will not be processed without prior client approval.
- Samples must be correctly preserved upon receipt, unless the method requested allows for laboratory preservation. If the samples are received with inadequate preservation, and the samples cannot be preserved by the lab appropriately, the samples will not be processed without prior client approval.
- Samples must be received within required holding time. Any samples with hold times that are exceeded will not be processed without prior client approval.
- Samples must be received with sufficient sample volume or weight to proceed with the analytical testing. If insufficient sample volume or weight is received, analysis will not proceed without client approval.
- All samples that require thermal preservation are considered acceptable if they are received at a temperature within 2°C of the required temperature, or within the method-specified range. For samples with a required temperature of 4°C, samples with a temperature ranging from just above freezing to 6°C are acceptable. Samples that are delivered to the lab on the same day they are collected are considered acceptable if the samples are received on ice. Any samples that are not received at the required temperature will not be processed without prior client approval.
- Samples for **drinking water** analyses will be rejected at the time of receipt if they are not received in a secure manner, are received in inappropriate containers, are received outside

the required temperature range, are received outside the recognized holding time, are received with inadequate identification on sample containers or COC, or are improperly preserved (with the exception of VOA samples- tested for pH at time of analysis and TOC- tested for pH in the field).

- Some specific clients may require custody seals. **For these clients**, samples or coolers that are not received with the proper custody seals will not be processed without prior client approval.

Note 1: Temperature will be read and recorded based on the precision of the measuring device. For example, temperatures obtained from a thermometer graduated to 0.1°C will be read and recorded to ± 0.1°C. Measurements obtained from a thermometer graduate to 0.5°C will be read to ± 0.5°C. Measurements read at the specified precision are not to be rounded down to meet the ≤ 6°C limit. Please reference the Support Equipment SOP for more information.

Note 2: Some microbiology methods allow sample receipt temperatures of up to 10°C. Consult the specific method for microbiology samples received above 6°C prior to initiating corrective action for out of temperature preservation conditions.

2.4.4. Upon sample receipt, the following items are also checked and recorded:

- Presence of custody seals or tapes on the shipping containers;
- Sample condition: Intact, broken/leaking, bubbles in VOA samples;
- Sample holding time;
- Sample pH and residual chlorine when required;
- Appropriate containers.

2.4.5. Additional information can be found in SOP S-DAL-C-001 **Sample Management** or its equivalent revision or replacement.

2.5. Sample Log-in

2.5.1. After sample inspection, all sample information on the COC is entered into the Laboratory Information Management System (LIMS). The lab's permanent records for samples received include the following information:

- Customer name and contact
- Customer number
- Pace Analytical project number
- Pace Analytical Project Manager
- Sample descriptions
- Due dates
- List of analyses requested
- Date and time of laboratory receipt
- Field ID code
- Date and time of collection
- Any comments resulting from inspection for sample rejection

2.5.2. If the time collected for any sample is unspecified and Pace is unable to obtain this information from the customer, the laboratory will use 12:01am as the time sampled. All hold times will be based on this sampling time and qualified accordingly if exceeded.

2.5.3. The LIMS automatically generates a unique identification number for each sample created in the system. The LIMS sample number follows the general convention of XXXXXX (insert LIMS sample numbering convention). This unique identification number is placed on the sample container as a durable label and becomes the link between the laboratory's sample management system and the customer's field identification; it will be a permanent reference number for all future interactions.

2.5.4. Sample labels are printed from the LIMS and affixed to each sample container.

2.5.5. Additional information can be found in SOP S-DAL-C-001 **Sample Management** or its equivalent revision or replacement.

2.6. Sample Storage

2.6.1. Additional information on sample storage can be found in SOP S-DAL-C-001 **Sample Management** or its equivalent revision or replacement and in SOP S-DAL-W-002 **Waste Handling and Management** or its equivalent revision or replacement.

2.6.2. **Storage Conditions**

2.6.2.1. Samples are stored away from all standards, reagents, or other potential sources of contamination. Samples are stored in a manner that prevents cross contamination. Volatile samples are stored separately from other samples. All sample fractions, extracts, leachates, and other sample preparation products are stored in the same manner as actual samples or as specified by the analytical method.

2.6.2.2. Storage blanks are stored with volatile samples and are used to measure cross-contamination acquired during storage. Laboratories must have documented procedures and criteria for evaluating storage blanks, appropriate to the types of samples being stored.

2.6.2.3. Additional information can be found in SOP S-DAL-Q-018 **Monitoring Temperature Controlled Units**.

2.6.3. **Temperature Monitoring**

2.6.3.1. Samples are taken to the appropriate storage location immediately after sample receipt and check-in procedures are completed.

2.6.3.2. The temperature of each refrigerated storage area is maintained at $\leq 6^{\circ}C$ (but above freezing) unless state, method or program requirements differ. The temperature of each freezer storage area is maintained at $\leq -10^{o}C$ unless state, method or program requirements differ. The temperature of each storage area is checked and documented each day of use (each calendar day). Additional information, including corrective actions for temperatures outside of acceptance limits, can be found in SOP S-DAL-Q-018, **Monitoring Temperature Controlled Units**.

2.6.4. **Hazardous Materials**

2.6.4.1. Samples designated by clients upon receipt as pure product or potentially heavily contaminated samples, or samples found to be designated as such following analysis, must be tagged as "hazardous" or "lab pack" and stored separately from other samples.

2.6.5. **Foreign/Quarantined Soils**

2.6.5.1. Foreign soils and soils from USDA regulated areas must be adequately segregated to enable proper sample disposal. The USDA requires these samples to be treated by an approved procedure. Additional information regarding USDA regulations and sample handling can be found in the laboratory's SOP for **Regulated Soil Handling** S-DAL-S-003, or its equivalent revision or replacement.

2.7. Subcontracting Analytical Services

2.7.1. Every effort is made to perform all analyses for Pace customers within the laboratory that receives the samples. When subcontracting to a laboratory other than the receiving laboratory, whether inside or outside the Pace network, becomes necessary, a preliminary verbal communication with that laboratory is undertaken. Customers are notified in writing of the laboratory's intention to subcontract any portion of the testing to another laboratory. Work performed under specific protocols may involve special considerations. When possible, subcontracting will be to a TNI-accredited laboratory.

2.7.2. Potential subcontract laboratories must be approved by Pace based on the criteria listed in SOP S-DAL-C-003 **Subcontracting Samples** or its equivalent revision or replacement. All sample reports from the subcontracted labs are appended to the applicable Pace final reports.

2.7.3. Any Pace Analytical work sent to other labs within the Pace network is handled as inter-regional work and all final reports are labeled clearly with the name of the laboratory performing the work. Any non-TNI work is clearly identified. Pace will not be responsible for analytical data if the subcontract laboratory was designated by the customer.

2.7.4. Additional information can be found in SOP S-DAL-C-003 **Subcontracting Samples** or its equivalent revision or replacement.

2.8. Sample Retention and Disposal

2.8.1. Samples, extracts, digestates, and leachates must be retained by the laboratory for the period of time necessary to protect the interests of the laboratory and the customer.

2.8.2. The minimum sample retention time is 45 days from receipt of the samples. Samples requiring thermal preservation may be stored at ambient temperature when the hold time is expired, the report has been delivered, and/or allowed by the customer, program, or contract. Samples requiring storage beyond the minimum sample retention time due to special requests or contractual obligations may be stored at ambient temperature unless the laboratory has sufficient capacity and their presence does not compromise the integrity of other samples.

2.8.3. After this period expires, non-hazardous samples are properly disposed of as non-hazardous waste. The preferred method for disposition of **hazardous** samples is to return the excess sample to the customer. If it is not feasible to return samples, or the customer requires Pace to dispose of excess samples, proper arrangements will be made for disposal by an approved contractor.

2.8.4. Additional information can be found in SOP S-DAL-W-002 **Waste Handling and Management** and SOP S-DAL-C-001 **Sample Management** or their equivalent revisions or replacements.

3.0. QUALITY CONTROL PROCEDURES

3.1. Quality Control Samples

3.1.1. The quality control samples described in this section are analyzed per batch as applicable to the method used. Acceptance criteria must be established for all quality control samples and if the acceptance criteria are not met, corrective actions must be performed and samples reanalyzed, or final reports must be appropriately qualified.

3.1.2. Quality control samples must be processed in the same manner as associated client samples.

3.1.3. Please reference the glossary of this Quality Manual for definitions of all quality control samples mentioned in this section.

3.1.4. Any deviations to the policies and procedures governing quality control samples must be approved by the QM/SQM.

3.2. Method Blank

3.2.1. A method blank is a negative control used to assess the preparation/analysis system for possible contamination and is processed through all preparation and analytical steps with its associated client samples. The method blank is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples. Method blanks are not applicable for certain analyses (i.e., pH, flash point, temperature, etc.).

3.2.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for method blanks.

3.3. Laboratory Control Sample

3.3.1. The Laboratory Control Sample (LCS) is a positive control used to assess the performance of the entire analytical system including preparation and analysis. The LCS is processed at a minimum frequency of one per preparation batch and is comprised of a matrix similar to the associated client samples.

3.3.2. The LCS contains **all** analytes required by a specific method or by the customer or regulatory agency, which may include full list of target compounds, with certain exceptions. The lab must ensure that all target components are included in the spike mixture for the LCS over a two (2) year period. In the absence of specified components, the laboratory will spike the LCS with the following compounds:

- For multi-peak analytes (e.g. PCBs, technical chlordane, toxaphene), a representative standard will be processed.
- For methods with long lists of analytes, a representative number of target analytes may be chosen. The following criteria is used to determine the number of LCS compounds used:
  - For methods with 1-10 target compounds, the laboratory will spike with all compounds;
  - For methods with 11-20 target compounds, the laboratory will spike with at least 10 compounds or 80%, whichever is greater;
  - For methods with greater than 20 compounds, the laboratory will spike with at least 16 compounds.

3.3.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for LCSs.

3.3.4. For LCSs containing a large number of analytes, it is statistically likely that a few recoveries will be outside of control limits. This does not necessarily mean that the system is out of control, and therefore no corrective action would be necessary (except for proper documentation). TNI has allowed for a minimum number of marginal exceedances, defined as recoveries that are beyond the LCS control limits (3X the standard deviation) but within than the marginal exceedance limits (4X the standard deviation). The number of allowable exceedances depends on the number of compounds in the LCS. If more analyte recoveries exceed the LCS control limits than is allowed (see below) or if any one analyte exceeds the marginal exceedance limits, then the LCS is considered non-compliant and corrective actions are necessary. The number of allowable exceedances is as follows:

- >90 analytes in the LCS- 5 analytes
- 71-90 analytes in the LCS- 4 analytes
- 51-70 analytes in the LCS- 3 analytes
- 31-50 analytes in the LCS- 2 analytes
- 11-30 analytes in the LCS- 1 analyte
- <11 analytes in the LCS- no analytes allowed out)

Note: the use of marginal exceedances is not approved for work from the state of South Carolina.

3.4. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

3.4.1. A matrix spike (MS) is a positive control used to determine the effect of the sample matrix on compound recovery for a particular method. A matrix spike/matrix spike duplicate (MS/MSD) set or matrix spike/sample duplicate set is processed at a frequency specified in a particular method or as determined by a specific customer request. The MS and MSD consist of the sample matrix that is spiked with known concentrations of target analytes.

3.4.2. The MS and MSD contain all analytes required by a specific method or by the customer or regulatory agency. In the absence of specified components, the laboratory will spike the MS/MSD with the same number of compounds as previously discussed in the LCS section. However, the lab must ensure that all targeted components are included in the spike mixture for the MS/MSD over a two (2) year period.

3.4.3. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for MS/MSDs.

3.5. Sample Duplicate

3.5.1. A sample duplicate is a second portion of sample that is prepared and analyzed in the laboratory along with the first portion. It is used to measure the precision associated with preparation and analysis. A sample duplicate is processed at a frequency specified by the particular method or as determined by a specific customer.

3.5.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for sample duplicates.

3.6. Surrogates

3.6.1. Surrogates are compounds that reflect the chemistry of target analytes and are typically added to samples for organic analyses to measure the extraction or purge efficiency and to monitor the effect of the sample matrix on compound recovery.

3.6.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for surrogates.

3.7. Internal Standards

3.7.1. Internal Standards are method-specific analytes that are added, as applicable, to every standard, QC sample, and client sample at a known concentration, prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes.

3.7.2. Please reference method-specific SOPs for acceptance criteria and associated corrective actions for internal standards.

3.8. Limit of Detection (LOD)

3.8.1. Pace laboratories use a documented procedure to determine a limit of detection (LOD) for each analyte of concern in each matrix reported. Unless otherwise noted in a published method, the procedure used by Pace laboratories to determine LODs is based on the Method Detection Limit (MDL) procedure outlined in 40 CFR Part 136, Appendix B. All sample processing steps of the preparation and analytical methods are included in the LOD determination including any clean ups.

3.8.2. Additional information can be found in SOP S-DAL-Q-004 **Determination of LOD and LOQ** or its equivalent revision or replacement.

3.9. Limit of Quantitation (LOQ)

3.9.1. A limit of quantitation (LOQ) for every analyte of concern must be determined. For Pace laboratories, this LOQ is referred to as the RL, or Reporting Limit. Results reported below the reporting limit are not allowed to be reported without qualification. For methods with a determined LOD, results can be reported out below the LOQ but above the LOD if they are properly qualified (e.g., J flag).

3.9.2. Additional information can be found in SOP S-DAL-Q-004 **Determination of LOD and LOQ** or its equivalent revision or replacement.

3.10. Estimate of Analytical Uncertainty

3.10.1. Pace laboratories can provide an estimation of uncertainty for results generated by the laboratory. The estimate quantifies the error associated with any given result at a 95% confidence interval. This estimate does not include bias that may be associated with sampling. The laboratory has a procedure in place for making this estimation. In the absence of a regulatory or customer-specific procedure, Pace laboratories base this estimation on the recovery data obtained from the Laboratory Control Samples. The uncertainty is a function of the standard deviation of the recoveries multiplied by the appropriate Student's t Factor at 95% confidence. Additional information

pertaining to the estimation of uncertainty and the exact manner in which it is derived are contained in the SOP S-DAL-Q-031 **Estimation of Measurement Uncertainty** or its equivalent revision or replacement.

3.10.2. The measurement of uncertainty is provided only on request by the customer, as required by specification or regulation and when the result is used to determine conformance within a specification limit.

3.11. Proficiency Testing (PT) Studies

3.11.1. Pace laboratories participate in a defined proficiency testing (PT) program. PT samples are obtained from NIST approved providers and analyzed and reported at a minimum of two times per year for the relevant fields of testing per matrix.

3.11.2. Additional information can be found in SOP S-DAL-Q-010 **Proficiency Testing Program** or its equivalent revision or replacement.

3.12. Rounding and Significant Figures

3.12.1. In general, the Pace laboratories report data to no more than three significant figures. Therefore, all measurements made in the analytical process must reflect this level of precision. In the event that a parameter that contributes to the final result has less than three significant figures of precision, the final result must be reported with no more significant figures than that of the parameter in question. The rounding rules listed below are descriptive of the LIMS and not necessarily of any supporting program such as Excel.

3.12.2. **Rounding:** Pace-Dallas follows the odd / even guidelines for rounding numbers:

- If the figure following the one to be retained is less than five, that figure is dropped and the retained ones are not changed (with three significant figures, 2.544 is rounded to 2.54).
- If the figure following the ones to be retained is greater than five, that figure is dropped and the last retained one is rounded up (with three significant figures, 2.546 is rounded to 2.55).
- If the figure following the ones to be retained is five and if there are no figures other than zeros beyond that five, then the five is dropped and the last figure retained is unchanged if it is even and rounded up if it is odd (with three significant figures, 2.525 is rounded to 2.52 and 2.535 is rounded to 2.54).

3.12.3. **Significant Figures**

3.12.3.1. Pace-Dallas follows the following convention for reporting to a specified number of significant figures. Unless specified by federal, state, or local requirements or on specific request by a customer, the laboratory reports:

Values > 10 – Reported to 3 significant figures
Values ≤ 10 – Reported to 2 significant figures

3.13. Retention Time Windows

3.13.1. When chromatographic conditions are changed, retention times and analytical separations are often affected. As a result, two critical aspects of any chromatographic method are the determination and verification of retention times and analyte separation. Retention time windows must be established for the identification of target analytes. The retention times of all target analytes in all calibration verification standards must fall within the retention time windows. If an analyte falls outside the retention time window in an ICV or CCV, new absolute retention time windows must be calculated, unless instrument maintenance fixes the problem. When a new column is installed, a new retention time window study must be performed.

3.13.2. Please reference method-specific SOPs for the proper procedure for establishing retention time windows.

3.14. Analytical Method Validation and Instrument Validation

3.14.1. In some situations, Pace develops and validates methodologies that may be more applicable to a specific problem or objective. When non-standard methods are required for specific projects or analytes of interest, or when the laboratory develops or modifies a method, the laboratory validates the method prior to applying it to customer samples. Method validity is established by meeting criteria for precision and accuracy as established by the data quality objectives specified by the end user of the data. The laboratory records the validation procedure, the results obtained and a statement as to the usability of the method. The minimum requirements for method validation include evaluation of sensitivity, quantitation, precision, bias, and selectivity of each analyte of interest.

3.15. Regulatory and Method Compliance

3.15.1. It is Pace policy to disclose in a forthright manner any detected noncompliance affecting the usability of data produced by our laboratories. The laboratory will notify customers within 30 days of fully characterizing the nature of the nonconformance, the scope of the nonconformance and the impact it may have on data usability.

4.0. DOCUMENT MANAGEMENT AND CHANGE CONTROL

4.1. Document Management

4.1.1. Additional information can be found in SOP S-DAL-Q-002 **Document Control and Management** or its equivalent revision or replacement. Information on Pace's policy for electronic signatures can also be found in this SOP.

4.1.2. Pace has an established procedure for managing documents that are part of the quality system.

4.1.3. A master list of all managed documents is maintained at each facility identifying the current revision status and distribution of the controlled documents.

4.1.4. Each managed document is uniquely identified to include the date of issue, the revision identification, page numbers, the total number of pages and the issuing authorities. For complete information on document numbering, refer to SOP S-ALL-Q-003 **Document Numbering**.

4.1.5. **Quality Assurance Manual (QAM):** The Quality Assurance Manual is the company-wide document that describes all aspects of the quality system for Pace. The base QAM template is distributed by the Corporate Environmental Quality Department to each of the SQMs/QMs. The local management personnel modify the necessary and permissible sections of the base template and then all applicable lab staff sign the Quality Assurance Manual. Each SQM/QM is then in charge of distribution to employees, external customers or regulatory agencies and maintaining a distribution list of controlled document copies. The Quality Assurance Manual template is reviewed on an annual basis and revised accordingly by the Corporate Quality office.

4.1.6. **Standard Operating Procedures (SOPs)**

4.1.6.1. SOPs are reviewed every two years at a minimum although a more frequent review may be required by some state or federal agencies or customers. If no revisions are made based on this review, documentation of the review itself is made by the addition of new signatures on the cover page. If revisions are made, documentation of the revisions is made in the revisions section of each SOP and a new revision number is applied to the SOP. This provides a historical record of all revisions.

4.1.6.2. All copies of superseded SOPs are removed from general use and the original copy of each SOP is archived for audit or knowledge preservation purposes. This ensures that all Pace employees use the most current version of each SOP and provides the SQM/QM with a historical record of each SOP.

4.1.6.3. Additional information can be found in SOP S-DAL-Q-001 **Preparation of SOPs** or its equivalent revision or replacement.

4.2. Document Change Control

4.2.1. Additional information can be found in SOP S-DAL-Q-002 **Document Control and Management** or its equivalent revision or replacement.

4.2.2. Changes to managed documents are reviewed and approved in the same manner as the original review. Any revision to a document requires the approval of the applicable signatories. After

revisions are approved, a revision number is assigned and the previous version of the document is officially retired.

4.2.3. All copies of the previous document are replaced with copies of the revised document and the superseded copies are destroyed or archived. All affected personnel are advised that there has been a revision and any necessary training is scheduled.

5.0. EQUIPMENT AND MEASUREMENT TRACEABILITY

5.1. Standards and Traceability

5.1.1. Each Pace facility retains pertinent information for standards, reagents, and chemicals to assure traceability to a national standard. This includes documentation of purchase, receipt, preparation, and use.

5.1.2. Upon receipt, all purchased standard reference materials are recorded into a standard logbook or database and assigned a unique identification number. The entries include the facility's unique identification number, the chemical name, manufacturer name, manufacturer's identification numbers, receipt date, and expiration date. Vendor's certificates of analysis for all standards, reagents, or chemicals are retained for future reference.

5.1.3. Subsequent preparations of intermediate or working solutions are also documented in a standard logbook or database. These entries include the stock standard name and lot number, the manufacturer name, the solvents used for preparation, the solvent lot number and manufacturer, the preparation steps, preparation date, expiration dates, preparer's initials, and a unique Pace identification number. This number is used in any applicable sample preparation or analysis logbook so the standard can be traced back to the standard preparation record. This process ensures traceability back to the national standard.

5.1.4. All prepared standard or reagent containers include the Pace identification number, the standard or chemical name, the date of preparation, the date of expiration, the concentration with units, and the preparer's initials, unless the container is too small to hold all of this information. This ensures traceability back to the standard preparation logbook or database.

5.1.5. All initial calibrations must be verified with a standard obtained from a second manufacturer or a separate lot prepared independently by the same manufacturer, unless client-specific QAPP requirements state otherwise.

5.1.6. Additional information concerning the procurement of standards and reagent and their traceability can be found in the SOP S-DAL-Q-025 **Standard and Reagent Management and Traceability** or its equivalent revision or replacement.

5.2. General Analytical Instrument Calibration Procedures

5.2.1. All applicable instrumentation are calibrated or checked before use to ensure proper functioning and verify that laboratory, client and regulatory requirements are met. All calibrations are performed by, or under the supervision of, an experienced analyst at scheduled intervals against either certified standards traceable to recognized national standards or reference standards whose values have been statistically validated.

5.2.2. Calibration standards for each parameter are chosen to establish the linear range of the instrument and must bracket the concentrations of those parameters measured in the samples. The lowest calibration standard is the lowest concentration for which quantitative data may be reported. Data reported below this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in a narrative. The highest calibration standard is the highest concentration for which quantitative data may be reported. Data reported above this level is considered to have less certainty and must be reported using appropriate data qualifiers or explained in the narrative.

5.2.3. Instrumentation or support equipment that cannot be calibrated to specification or is otherwise defective is clearly labeled as out-of-service until it has been repaired and tested to demonstrate it meets the laboratory's specifications. All repair and maintenance activities including service calls are documented in the maintenance log. Equipment sent off-site for calibration testing is packed and transported to prevent breakage and is in accordance with the calibration laboratory's recommendations.

5.2.4. In the event that recalibration of a piece of test equipment indicates the equipment may have been malfunctioning during the course of sample analysis, an investigation is performed. The results of the investigation along with a summary of the information reviewed are documented and maintained by the quality manager. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed. This allows for sufficient investigation and review of documentation to determine the impact on the analytical results. Instrumentation found to be consistently out of calibration is either repaired and positively verified or taken out of service and replaced.

5.2.5. Raw data records are retained to document equipment performance. Sufficient raw data is retained to reconstruct the instrument calibration and explicitly connect the continuing calibration verification to the initial calibration.

5.3. Support Equipment Calibration and Verification Procedures

5.3.1. All support equipment is calibrated or verified at least annually using NIST traceable references over the entire range of use, as applicable. The results of calibrations or verifications must be within the specifications required or the equipment will be removed from service until brought back into control. Additional information regarding calibration and maintenance of support equipment can be found in SOP S-DAL-Q-013 **Support Equipment** or its equivalent revision or replacement.

5.3.2. On each day the support equipment is used, it is verified, as applicable, in the expected range of use with NIST traceable references in order to ensure the equipment meets laboratory specifications. These checks are documented appropriately. This applies mainly to thermometers within temperature-controlled units and balances.

5.3.3. **Analytical Balances**

5.3.3.1. Each analytical balance is calibrated or verified at least annually by a qualified service technician. The calibration of each balance is verified each day of use with weights traceable to NIST bracketing the range of use. Calibration weights are ASTM Class 1 or other class weights that have been calibrated against a NIST standard weight and are re-certified every 5 years at a minimum against a NIST traceable reference. Some accrediting agencies may require more frequent checks. If balances are calibrated by an external agency, verification of their weights must be provided. All information pertaining to balance maintenance and calibration is recorded in the individual balance logbook and/or is maintained on file in the local Quality department.

5.3.4. Thermometers

5.3.4.1. Certified, or reference, thermometers are maintained for checking calibration of working thermometers. Reference thermometers are provided with NIST traceability for initial calibration and are re-certified, at a minimum, every 3 years with equipment directly traceable to NIST.

5.3.4.2. Working thermometers are compared with the reference thermometers annually according to corporate metrology procedures (working digital thermometers are calibrated quarterly). Each thermometer is individually numbered and assigned a correction factor based on the NIST reference

source. In addition, working thermometers are visually inspected by laboratory personnel prior to use and temperatures are documented.

5.3.4.3. Laboratory thermometer inventory and calibration data are maintained in the local Quality department.

5.3.5. pH/Electrometers

5.3.5.1. The meter is calibrated before use each day, using fresh buffer solutions.

5.3.6. Spectrophotometers

5.3.6.1. During use, spectrophotometer performance is checked at established frequencies in analysis sequences against initial calibration verification (ICV) and continuing calibration verification (CCV) standards.

5.3.7. Mechanical Volumetric Dispensing Devices

5.3.7.1. Mechanical volumetric dispensing devices including bottle top dispensers (those that are critical in measuring a required amount of reagent), pipettes, and burettes, excluding Class A volumetric glassware, are checked for accuracy on a quarterly basis.

5.3.7.2. Additional information regarding calibration and maintenance of laboratory support equipment can be found in SOP S-DAL-Q-013 **Support Equipment** or its equivalent revision or replacement.

5.4. Instrument/Equipment Maintenance

5.4.1. The objectives of the Pace Analytical maintenance program are twofold: to establish a system of instrument care that maintains instrumentation and equipment at required levels of calibration and sensitivity, and to minimize loss of productivity due to repairs.

5.4.2. The Operations Manager and/or department manager/supervisors are responsible for providing technical leadership to evaluate new equipment, solve equipment problems, and coordinate instrument repair and maintenance. Analysts have the primary responsibility to perform routine maintenance.

5.4.3. To minimize downtime and interruption of analytical work, preventative maintenance may routinely performed on each analytical instrument. Up-to-date instructions on the use and maintenance of equipment are available to staff in the department where the equipment is used.

5.4.4. Department manager/supervisors are responsible for maintaining an adequate inventory of spare parts required to minimize equipment downtime. This inventory includes parts and supplies that are subject to frequent failure, have limited lifetimes, or cannot be obtained in a timely manner should a failure occur.

5.4.5. All major equipment and instrumentation items are uniquely identified to allow for traceability. Equipment/instrumentation is, unless otherwise stated, identified as a system and not as individual pieces. The laboratory maintains equipment records that include the following:

- The name of the equipment and its software
- The manufacturer's name, type, and serial number
- Approximate date received and date placed into service
- Current location in the laboratory
- Condition when received (new, used, etc.)

- Copy of any manufacturer's manuals or instructions
- Dates and results of calibrations and next scheduled calibration (if known)
- Details of past maintenance activities, both routine and non-routine
- Details of any damage, modification or major repairs

5.4.6. All instrument maintenance is documented in maintenance logbooks that are assigned to each particular instrument or system.

5.4.7. The maintenance log entry must include a summary of the results of that analysis and verification by the analyst that the instrument has been returned to an in-control status. In addition, each entry must include the initials of the analyst making the entry, the dates the maintenance actions were performed, and the date the entry was made in the maintenance logbook, if different from the date(s) of the maintenance.

5.4.8. Any equipment that has been subjected to overloading or mishandling, or that gives suspect results, or has been shown to be defective, is taken out of service and clearly identified. The equipment shall not be used to analyze customer samples until it has been repaired and shown to perform satisfactorily. In the event of instrumentation failure, to avoid hold time issues, the lab may subcontract the necessary samples to another Pace lab or to an outside subcontract lab if possible.

6.0. CONTROL OF DATA

Analytical results processing, verification, and reporting are procedures employed that result in the delivery of defensible data. These processes include, but are not limited to, calculation of raw data into final concentration values, review of results for accuracy, evaluation of quality control criteria and assembly of technical reports for delivery to the data user.

All analytical data undergo a documented multi-tier review process prior to being reported to the customer. This section describes procedures used for translating raw analytical data into accurate final sample reports as well as Pace data storage policies.

When analytical, field, or product testing data is generated, it is documented appropriately. These logbooks and other laboratory records are kept in accordance with each facility's SOP for documentation storage and archival In this case, the laboratory must ensure that there are sufficient redundant electronic copies so no data is lost due to unforeseen computer issues

6.1. Primary Data Review

6.1.1. The primary analyst is responsible for initial data reduction and data review. This includes confirming compliance with required methodology, verifying calculations, evaluating quality control data, noting non-conformances in logbooks or as footnotes or narratives, and uploading analytical results into the LIMS. Data review checklists, either hardcopy or electronic, are used to document the primary data review process. The primary analyst must be clearly identified in all applicable logbooks, spreadsheets, LIMS fields, and data review checklists.

6.1.2. The primary analyst compiles the initial data for secondary data review. This compilation must include sufficient documentation for secondary data review.

6.1.3. Additional information regarding data review procedures can be found in SOP S-DAL-Q-037 **Data Review** or its equivalent revision or replacement, as well as in SOP S-ALL-Q-016 **Manual Integration** or its equivalent revision or replacement.

6.2. Secondary Data Review

6.2.1. Secondary data review is the process of examining data and accepting or rejecting it based on pre-defined criteria. This review step is designed to ensure that reported data are free from calculation and transcription errors, that quality control parameters are evaluated, and that any non-conformances are properly documented.

6.2.2. The completed data from the primary analyst is sent to a designated qualified secondary data reviewer (this cannot be the primary analyst). The secondary data reviewer provides an independent technical assessment of the data package and technical review for accuracy according to methods employed and laboratory protocols. This assessment involves a quality control review for use of the proper methodology and detection limits, compliance to quality control protocol and criteria, presence and completeness of required deliverables, and accuracy of calculations and data quantitation. The reviewer validates the data entered into the LIMS and documents approval of manual integrations. Data review checklists, either hardcopy or electronic, are used to document the secondary data review process.

6.2.3. Additional information regarding data review procedures can be found in SOP S-DAL-Q-037 **Data Review** or its equivalent revision or replacement, as well as in SOP S-ALL-Q-016 **Manual Integration** or its equivalent revision or replacement.

6.3. Data Reporting

6.3.1. Data for each analytical fraction pertaining to a particular Pace project number are delivered to the Project Manager for assembly into the final report. All points mentioned during technical and QC reviews are included in data qualifiers on the final report or in a separate case narrative if there is potential for data to be impacted.

6.3.2. Final reports are prepared according to the level of reporting required by the customer and can be transmitted to the customer via hardcopy or electronic deliverable. Please reference SOP S-DAL-Q-041 **Final Reports and Deliverables** or its equivalent revision or replacement.

6.3.3. Additional items may be required per Client QAPPs or different state regulations, i.e., affidavit of compliance or review.

6.3.4. Any changes made to a final report shall be designated as "Revised" or equivalent wording. The laboratory must keep sufficient archived records of all laboratory reports and revisions. For higher levels of data deliverables, a copy of all supporting raw data is sent to the customer along with a final report of results. Pace will provide electronic data deliverables (EDD) as required by contracts or upon customer request.

6.3.5. Customer data that requires transmission by telephone, telex, facsimile or other electronic means undergoes appropriate steps to preserve confidentiality.

6.3.6. The following positions are the only approved signatories for Pace final reports:

- Senior General Manager
- General Manager
- Assistant General Manager
- Senior Quality Manager
- Quality Manager
- Client Services Manager
- Project Manager
- Project Coordinator

6.4. Data Security

6.4.1. All data including electronic files, logbooks, extraction/digestion/distillation worksheets, calculations, project files and reports, and any other information used to produce the technical report are maintained secured and retrievable by the Pace facility.

6.5. Data Archiving

6.5.1. All records compiled by Pace are archived in a suitable, limited-access environment to prevent loss, damage, or deterioration by fire, flood, vermin, theft, and/or environmental deterioration. Records are retained for a minimum of five years unless superseded by federal, state, contractual, and/or accreditation requirements. The Texas Risk Reduction Program (TRRP) requires

a ten-year archival period. TNI-related records will be made readily available to accrediting authorities. Access to archived data is documented and controlled by the SQM/QM or a designated Data Archivist.

6.5.2. Records that are computer-generated have either a hard copy or electronic backup copy. Hardware and software necessary for the retrieval of electronic data is maintained with the applicable records. Archived electronic records are stored protected against electronic and/or magnetic sources.

6.5.3. In the event of a change in ownership, accountability or liability, reports of analyses performed pertaining to accreditation will be maintained per the purchase agreement. In the event of bankruptcy, laboratory reports and/or records will be transferred to the customer and/or the appropriate regulatory entity upon request.

6.6. Data Disposal

6.6.1. Data that has been archived for the facility's required storage time may be disposed of in a secure manner by shredding, returning to customer, or utilizing some other means that does not jeopardize data confidentiality. Records of data disposal will be archived for a minimum of five years unless superseded by federal, contractual, and/or accreditation requirements. Data disposal includes any preliminary or final reports that are disposed.

7.0. QUALITY SYSTEM AUDITS AND REVIEWS

7.1. Internal Audits

7.1.1. Responsibilities

7.1.1.1. The SQM/QM is responsible for managing and/or conducting internal audits in accordance with a predetermined schedule and procedure. Since internal audits represent an independent assessment of laboratory functions, the auditor must be independent from laboratory operations to ensure objectivity. The auditor must be trained, qualified, and familiar enough with the objectives, principles, and procedures of laboratory operations to be able to perform a thorough and effective evaluation. The SQM/QM evaluates audit observations and verifies the completion of corrective actions. In addition, a periodic corporate audit will be conducted. The corporate audits will focus on the effectiveness of the Quality System as outlined in this manual but may also include other quality programs applicable to an individual laboratory.

7.1.1.2. Additional information can be found in SOP S-DAL-Q-011 **Internal and External Audits** or its equivalent revision or replacement.

7.1.2. Scope and Frequency of Internal Audits

7.1.2.1. The complete internal audit process consists of the following four sections: 1) Raw Data Reviews, 2) traditional Quality Systems internal audits (including SOP and method compliance), 3) Final Report Reviews, and 4) Corrective Action Effectiveness Follow-up.

7.1.2.2. Internal systems audits are conducted yearly at a minimum. The scope of these audits includes evaluation of specific analytical departments or a specific quality related system as applied throughout the laboratory.

7.1.2.3. Where the identification of non-conformities or departures cast doubt on the laboratory's compliance with its own policies and procedures, the lab must ensure that the appropriate areas of activity are audited as soon as possible.

7.1.2.4. Certain projects may require an internal audit to ensure laboratory conformance to site work plans, sampling and analysis plans, QAPPs, etc.

7.1.2.5. The laboratory, as part of their overall internal audit program, ensures that a review is conducted with respect to any evidence of inappropriate actions or vulnerabilities related to data integrity. Discovery and reporting of potential data integrity issues are handled in a confidential manner. All investigations that result in findings of inappropriate activity are fully documented, including the source of the problem, the samples and customers affected the impact on the data, the corrective actions taken by the laboratory, and which final reports had to be re-issued. Customers must be notified within 30 days after the data investigation is completed and the impact to final results is assessed.

7.1.3. Internal Audit Reports and Corrective Action Plans

7.1.3.1. A full description of the audit, including the identification of the operation audited, the date(s) on which the audit was conducted, the specific systems examined, and the observations noted are summarized in an internal audit report. Although other personnel may assist with the

performance of the audit, the SQM/QM writes and issues the internal audit report identifying which audit observations are deficiencies that require corrective action.

7.1.3.2. When audit findings cast doubt on the effectiveness of the operations or on the correctness of validity of the laboratory's environmental test results, the laboratory will take timely corrective action and notify the customer in writing within three business days, if investigations show that the laboratory results may have been affected.

7.1.3.3. Additional information can be found in SOP S-DAL-Q-011 **Internal and External Audits** or its equivalent revision or replacement.

7.2. External Audits

7.2.1. Pace laboratories are audited regularly by regulatory agencies to maintain laboratory certifications and by customers to maintain appropriate specific protocols.

7.2.2. External audit teams review the laboratory to assess the effectiveness of quality systems. The SQM/QM host the external audit team and assist in facilitation of the audit process. After the audit, the external auditors will prepare a formalized audit report listing deficiencies observed and follow-up requirements for the laboratory. The laboratory staff and supervisors develop corrective action plans to address any deficiencies with the guidance of the SQM/QM, who provides a written response to the external audit team. The SQM/QM follows-up with the laboratory staff to ensure corrective actions are implemented and that the corrective action was effective.

7.3. Annual Managerial Review

7.3.1. A managerial review of Management and Quality Systems is performed on an annual basis at a minimum. This allows for assessing program effectiveness and introducing changes and/or improvements. Additional information can be found in SOP S-ALL-Q-015 **Review of Laboratory Management System** or its equivalent revision or replacement.

7.3.2. The managerial review must include the following topics of discussion:

- Suitability of quality management policies and procedures
- Manager/Supervisor reports
- Internal audit results
- Corrective and preventive actions
- External assessment results
- Proficiency testing studies
- Sample capacity and scope of work changes
- Customer feedback, including complaints
- Recommendations for improvement,
- Other relevant factors, such as quality control activities, resources, and staffing.

7.3.3. This managerial review must be documented for future reference by the SQM/QM and copies of the report are distributed to laboratory staff. Results must feed into the laboratory planning system and must include goals, objectives, and action plans for the coming year. The laboratory shall ensure that any actions identified during the review are carried out within an appropriate and agreed upon timescale.

8.0. CORRECTIVE ACTION

Additional information can be found in SOP S-DAL-Q-012 **Corrective and Preventive Actions** or its equivalent revision or replacement.

During the process of sample handling, preparation, and analysis, or during review of quality control records, or during reviews of non-technical portions of the lab, certain occurrences may warrant the necessity of corrective actions. These occurrences may take the form of analyst errors, deficiencies in quality control, method deviations, or other unusual circumstances. The Quality System of Pace provides systematic procedures for the documentation, monitoring, completion of corrective actions, and follow-up verification of the effectiveness of these corrective actions. This can be done using Pace's LabTrack system or other system that lists at a minimum, the deficiency by issue number, the deficiency source, responsible party, root cause, resolution, due date, and date resolved.

8.1. Corrective and Preventive Action Documentation

8.1.1. The following items are examples of sources of laboratory deviations or non-conformances that may warrant some form of documented corrective action:

- Internal Laboratory Non-Conformance Trends
- Proficiency Testing Sample Results
- Internal and External Audits
- Data or Records Review
- Client Complaints
- Client Inquiries
- Holding Time violations

8.1.2. Documentation of corrective actions may be in the form of a comment or footnote on the final report that explains the deficiency (e.g., matrix spike recoveries outside of acceptance criteria) or it may be a more formal documentation (either paper system or computerized spreadsheet). This depends on the extent of the deficiency, the impact on the data, and the method or customer requirements for documentation.

8.1.3. The person who discovers the deficiency or non-conformance initiates the corrective action documentation within the lab's corrective action system. The documentation must include (as applicable): the affected projects and sample numbers, the name of the applicable Project Manager, the customer name, and the sample matrix involved. The person initiating the corrective action documentation must also list the known causes of the deficiency or non-conformance as well as any corrective/preventative actions that they have taken. Preventive actions must be taken in order to prevent or minimize the occurrence of the situation.

8.1.4. **Root Cause Analysis**: Laboratory personnel and management staff will start a root cause analysis by going through an investigative process. During this process, the following general steps must be taken into account: defining the non-conformance, assigning responsibilities, determining if the condition is significant, and investigating the root cause of the nonconformance. General non-conformance investigative techniques follow the path of the sample through the process looking at each individual step in detail. The root cause must be documented within the lab's corrective action system.

8.1.5. Based on the root cause(s) determined, the lab implements applicable corrective actions and verifies their effectiveness. In the event that analytical testing or results do not conform to documented laboratory policies or procedures Project Management will notify the customer of the situation and will advise of any ramifications to data quality if impacted (with the possibility of work being recalled).

8.2. Corrective Action Completion

8.2.1. Internal Laboratory Non-Conformance Trends

8.2.1.1. There are several types of non-conformance trends that may occur in the laboratory that would require the initiation of a corrective action report. Laboratories may choose to initiate a corrective action for all instances of one or more of these categories if they so choose, however the intent is that each of these would be handled according to its severity; one time instances could be handled with a footnote or qualifier whereas a systemic problem with any of these categories may require an official corrective action process. These categories, as defined in the Corrective Action SOP are as follows:

- Login error
- Preparation Error
- Contamination
- Calibration Failure
- Internal Standard Failure
- LCS Failure
- Laboratory accident
- Spike Failure
- Instrument Failure
- Final Reporting error

8.2.2. PE/PT Sample Results

8.2.2.1. Any PT result assessed as “not acceptable” requires an investigation and applicable corrective actions. The operational staff is made aware of the PT failures and they are responsible for reviewing the applicable raw data and calibrations and list possible causes for error. The SQM/QM reviews their findings and initiates another external PT sample or an internal PT sample to try and correct the previous failure. Replacement PT results must be monitored by the SQM/QM and reported to the applicable regulatory authorities.

8.2.2.2. Additional information, such as requirements regarding time frames for reporting failures to states, makeup PTs, and notifications of investigations, can be found in SOP S-DAL-Q-010 **Proficiency Testing Program** or its equivalent revision or replacement.

8.2.3. Internal and External Audits

8.2.3.1. The SQM/QM is responsible for documenting all audit findings and their corrective actions. This documentation must include the initial finding, the persons responsible for the corrective action, the due date for responding to the auditing body, the root cause of the finding, and the corrective actions needed for resolution. The SQM/QM is also responsible for providing any back-up documentation used to demonstrate that a corrective action has been completed.

8.2.4. Data Review

8.2.4.1. In the course of performing primary and secondary review of data or in the case of raw data reviews (e.g., by the SQM/QM), errors may be found which require corrective actions. Any finding that affects the quality of the data requires some form of corrective action, which may include revising and re-issuing of final reports.

8.2.5. **Client Complaints**

8.2.5.1. Project Managers are responsible for issuing corrective action forms, when warranted, for customer complaints. As with other corrective actions, the possible causes of the problem are listed and the form is passed to the appropriate analyst or supervisor for investigation. After potential corrective actions have been determined, the Project Manager reviews the corrective action form to ensure all customer needs or concerns are being adequately addressed.

8.2.6. **Client Inquiries**

8.2.6.1. When an error on the customer report is discovered, the Project Manager is responsible for initiating a formal corrective action form that describes the failure (e.g., incorrect analysis reported, reporting units are incorrect, or reporting limits do not meet objectives). The Project Manager is also responsible for revising the final report if necessary and submitting it to the customer.

8.2.7. **Holding Time Violations**

8.2.7.1. In the event that a holding time has been missed, the analyst or supervisor must complete a formal corrective action form. The Project Manager and the SQM/QM must be made aware of all holding time violations.

8.2.7.2. The Project Manager must contact the customer in order that appropriate decisions are made regarding the hold time excursion and the ultimate resolution is then documented and included in the customer project file.

9.0. GLOSSARY

The source of some of the definitions is indicated previous to the actual definition (e.g., TNI, DoD).

Terms and Definitions	
3P Program	The Pace continuous improvement program that focuses on Process, Productivity, and Performance. Best Practices are identified that can be used by all Pace labs.
Acceptance Criteria	TNI- Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	TNI- The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. DoD- Refers to accreditation in accordance with the DoD ELAP.
Accreditation Body (AB)	TNI- The organization having responsibility and accountability for environmental laboratory accreditation and which grants accreditation under this program. DoD- Entities recognized in accordance with the DoD-ELAP that are required to operate in accordance with ISO/IEC 17011, Conformity assessment: General requirements for accreditation bodies accrediting conformity assessment bodies. The AB must be a signatory, in good standing, to the International Laboratory Accreditation Cooperation (ILAC) mutual recognition arrangement (MRA) that verifies, by evaluation and peer assessment, that its signatory members are in full compliance with ISO/IEC 17011 and that its accredited laboratories comply with ISO/IEC 17025.
Accuracy	TNI- The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Activity, Absolute	TNI- Rate of nuclear decay occurring in a body of material, equal to the number of nuclear disintegrations per unit time. NOTE: Activity (absolute) may be expressed in becquerels (Bq), curies (Ci), or disintegrations per minute (dpm), and multiples or submultiples of these units.
Activity, Areic	TNI- Quotient of the activity of a body of material and its associated area.
Activity, Massic	TNI- Quotient of the activity of a body of material and its mass; also called specific activity.
Activity, Volumic	TNI- Quotient of the activity of a body of material and its volume; also called activity concentration. NOTE: In this module [TNI Volume 1, Module 6], unless otherwise stated, references to activity shall include absolute activity, areic activity, massic activity, and volumic activity.
Activity Reference Date	TNI- The date (and time, as appropriate to the half-life of the radionuclide) to which a reported activity result is calculated. NOTE: The sample collection date is most frequently used as the Activity Reference Date for environmental measurements, but different programs may specify other points in time for correction of results for decay and ingrowth.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.

American Society for Testing and Materials (ASTM)	An international standards organization that develops and publishes voluntary consensus standards for a wide range of materials, products, systems and services.
Analysis	DoD- A combination of sample preparation and instrument determination.
Analysis Code (Acode)	All the set parameters of a test, such as Analytes, Method, Detection Limits and Price.
Analysis Sequence	A compilation of all samples, standards and quality control samples run during a specific amount of time on a particular instrument in the order they are analyzed.
Analyst	TNI- The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.
Analyte	TNI- A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed. DoD- The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family and are analyzed together.
Analytical Method	DoD- A formal process that identifies and quantifies the chemical components of interest (target analytes) in a sample.
Analytical Uncertainty	TNI- A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Aliquot	DoD- A discrete, measured, representative portion of a sample taken for analysis.
Annual (or Annually)	Defined by Pace as every 12 months ± 30 days.
Assessment	TNI - The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its system to defined criteria (to the standards and requirements of laboratory accreditation). DoD- An all-inclusive term used to denote any of the following: audit, performance evaluation, peer review, inspection, or surveillance conducted on-site.
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.
Atomization	A process in which a sample is converted to free atoms.
Audit	TNI- A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.

Batch	TNI- Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same quality systems matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples.
Batch, Radiation Measurements (RMB)	TNI- An RMB is composed of 1 to 20 environmental samples that are counted directly without preliminary physical or chemical processing that affects the outcome of the test (e.g., non-destructive gamma spectrometry, alpha/beta counting of air filters, or swipes on gas proportional detectors). The samples in an RMB share similar physical and chemical parameter, and analytical configurations (e.g., analytes, geometry, calibration, and background corrections). The maximum time between the start of processing of the first and last in an RMB is 14 calendar days.
Bias	TNI- The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank	TNI and DoD- A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results (See Method Blank). DoD- Blank samples are negative control samples, which typically include field blank samples (e.g., trip blank, equipment (rinsate) blank, and temperature blank) and laboratory blank samples (e.g., method blank, reagent blank, instrument blank, calibration blank, and storage blank).
Blind Sample	A sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.
BNA (Base Neutral Acid compounds)	A list of semi-volatile compounds typically analyzed by mass spectrometry methods. Named for the way they can be extracted out of environmental samples in an acidic, basic or neutral environment.
BOD (Biochemical Oxygen Demand)	Chemical procedure for determining how fast biological organisms use up oxygen in a body of water.

Calibration	TNI- A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. 1) In calibration of support equipment, the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI); 2) In calibration according to test methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.
Calibration Curve	TNI- The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	A defined technical procedure for performing a calibration.
Calibration Range	DoD- The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.
Calibration Standard	TNI- A substance or reference material used for calibration.
Certified Reference Material (CRM)	TNI- Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody	An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Chain of Custody Form (COC)	TNI- Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and type of containers; the mode of collection, the collector, time of collection; preservation; and requested analyses.
Chemical Oxygen Demand (COD)	A test commonly used to indirectly measure the amount of organic compounds in water.
Client (referred to by ISO as Customer)	Any individual or organization for whom items or services are furnished or work performed in response to defined requirements and expectations.
Code of Federal Regulations (CFR)	A codification of the general and permanent rules published in the Federal Register by agencies of the federal government.
Comparability	An assessment of the confidence with which one data set can be compared to another. Comparable data are produced through the use of standardized procedures and techniques.
Completeness	The percent of valid data obtained from a measurement system compared to the amount of valid data expected under normal conditions. The equation for completeness is: % Completeness = (Valid Data Points/Expected Data Points)*100

Confirmation	TNI- Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: second-column confirmation; alternate wavelength; derivatization; mass spectral interpretation; alternative detectors; or additional cleanup procedures. DoD- Includes verification of the identity and quantity of the analyte being measured by another means (e.g., by another determinative method, technology, or column). Additional cleanup procedures alone are not considered confirmation techniques.
Conformance	An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.
Congener	A member of a class of related chemical compounds (e.g., PCBs, PCDDs).
Consensus Standard	DoD- A standard established by a group representing a cross-section of a particular industry or trade, or a part thereof.
Continuing Calibration Blank (CCB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Continuing Calibration Check Compounds (CCC)	Compounds listed in mass spectrometry methods that are used to evaluate an instrument calibration from the standpoint of the integrity of the system. High variability would suggest leaks or active sites on the instrument column.
Continuing Calibration Verification	DoD- The verification of the initial calibration. Required prior to sample analysis and at periodic intervals. Continuing calibration verification applies to both external and internal standard calibration techniques, as well as to linear and non-linear calibration models.
Continuing Calibration Verification (CCV) Standard	Also referred to as a Calibration Verification Standard (CVS) in some methods, it is a standard used to verify the initial calibration of compounds in an analytical method. CCVs are analyzed at a frequency determined by the analytical method.
Continuous Emission Monitor (CEM)	A flue gas analyzer designed for fixed use in checking for environmental pollutants.
Continuous Improvement Plan (CIP)	The delineation of tasks for a given laboratory department or committee to achieve the goals of that department.
Contract Laboratory Program (CLP)	A national network of EPA personnel, commercial labs, and support contractors whose fundamental mission is to provide data of known and documented quality.
Contract Required Detection Limit (CRDL)	Detection limit that is required for EPA Contract Laboratory Program (CLP) contracts.
Contract Required Quantitation Limit (CRQL)	Quantitation limit (reporting limit) that is required for EPA Contract Laboratory Program (CLP) contracts.
Control Chart	A graphic representation of a series of test results, together with limits within which results are expected when the system is in a state of statistical control (see definition for Control Limit)

Control Limit	A range within which specified measurement results must fall to verify that the analytical system is in control. Control limit exceedances may require corrective action or require investigation and flagging of non-conforming data.
Correction	DoD- Action taken to eliminate a detected non-conformity.
Corrective Action	DoD- The action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence. A root cause analysis may not be necessary in all cases.
Corrective and Preventative Action (CAPA)	The primary management tools for bringing improvements to the quality system, to the management of the quality system's collective processes, and to the products or services delivered which are an output of established systems and processes.
Critical Value	TNI- Value to which a measurement result is compared to make a detection decision (also known as critical level or decision level). NOTE: The Critical Value is designed to give a specified low probability α of false detection in an analyte-free sample, which implies that a result that exceeds the Critical Value, gives high confidence $(1 - \alpha)$ that the radionuclide is actually present in the material analyzed. For radiometric methods, α is often set at 0.05.
Customer	DoD- Any individual or organization for which products or services are furnished or work performed in response to defined requirements and expectations.
Data Integrity	TNI- The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.
Data Quality Objective (DQO)	Systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use or end user.
Data Reduction	TNI- The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more usable form.
Definitive Data	DoD- Analytical data of known quantity and quality. The levels of data quality on precision and bias meet the requirements for the decision to be made. Data that is suitable for final decision-making.
Demonstration of Capability (DOC)	TNI- A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. DoD- A procedure to establish the ability of the analyst to generate analytical results by a specific method that meet measurement quality objectives (e.g., for precision and bias).
Department of Defense (DoD)	An executive branch department of the federal government of the United States charged with coordinating and supervising all agencies and functions of the government concerned directly with national security.
Detection Limit (DL)	DoD- The smallest analyte concentration that can be demonstrated to be different than zero or a blank concentration with 99% confidence. At the DL, the false positive rate (Type 1 error) is 1%. A DL may be used as the lowest concentration for reliably reporting a detection of a specific analyte in a specific matrix with a specific method with 99% confidence.

Detection Limit (DL) for Safe Drinking Water Act (SDWA) Compliance	TNI- Laboratories that analyze drinking-water samples for SDWA compliance monitoring must use methods that provide sufficient detection capability to meet the detection limit requirements established in 40 CFR 141. The SDWA DL for radioactivity is defined in 40 CFR Part 141.25.c as the radionuclide concentration, which can be counted with a precision of plus or minus 100% at the 95% confidence level (1.96σ where σ is the standard deviation of the net counting rate of the sample).
Deuterated Monitoring Compounds (DMCs)	DoD- SIM specific surrogates as specified for GC/MS SIM analysis.
Diesel Range Organics (DRO)	A range of compounds that denote all the characteristic compounds that make up diesel fuel (range can be state or program specific).
Digestion	DoD- A process in which a sample is treated (usually in conjunction with heat and acid) to convert the target analytes in the sample to a more easily measured form.
Document Control	The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.
Documents	DoD- Written components of the laboratory management system (e.g., policies, procedures, and instructions).
Dry Weight	The weight after drying in an oven at a specified temperature.
Duplicate (also known as Replicate or Laboratory Duplicate)	The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results of duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.
Electron Capture Detector (ECD)	Device used in GC methods to detect compounds that absorb electrons (e.g., PCB compounds).
Electronic Data Deliverable (EDD)	A summary of environmental data (usually in spreadsheet form) which clients request for ease of data review and comparison to historical results.
Eluent	A solvent used to carry the components of a mixture through a stationary phase.
Elute	To extract, specifically, to remove (absorbed material) from an absorbent by means of a solvent.
Elution	A process in which solutes are washed through a stationary phase by movement of a mobile phase.
Environmental Data	DoD- Any measurements or information that describe environmental processes, locations, or conditions; ecological or health effects and consequences; or the performance of environmental technology.
Environmental Monitoring	The process of measuring or collecting environmental data.
Environmental Protection Agency (EPA)	An agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.

Environmental Sample	A representative sample of any material (aqueous, non-aqueous, or multimedia) collected from any source for which determination of composition or contamination is requested or required. Environmental samples can generally be classified as follows: • Non Potable Water (Includes surface water, ground water, effluents, water treatment chemicals, and TCLP leachates or other extracts) • Drinking Water - Delivered (treated or untreated) water designated as potable water • Water/Wastewater - Raw source waters for public drinking water supplies, ground waters, municipal influents/effluents, and industrial influents/effluents • Sludge - Municipal sludges and industrial sludges. • Soil - Predominately inorganic matter ranging in classification from sands to clays. • Waste - Aqueous and non-aqueous liquid wastes, chemical solids, and industrial liquid and solid wastes
Equipment Blank	A sample of analyte-free media used to rinse common sampling equipment to check effectiveness of decontamination procedures.
Extracted Internal Standard Analyte	Isotopically labeled analogs of analytes of interest added to all standards, blanks and samples analyzed. Added to samples and batch QC samples prior to the first step of sample extraction and to standards and instrument blanks prior to analysis. Used for isotope dilution methods.
Facility	A distinct location within the company that has unique certifications, personnel and waste disposal identifications.
False Negative	DoD- A result that fails to identify (detect) an analyte or reporting an analyte to be present at or below a level of interest when the analyte is actually above the level of interest.
False Positive	DoD- A result that erroneously identifies (detects) an analyte or reporting an analyte to be present above a level of interest when the analyte is actually present at or below the level of interest.
Field Blank	A blank sample prepared in the field by filling a clean container with reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken.
Field Measurement	Determination of physical, biological, or radiological properties, or chemical constituents that are measured on-site, close in time and space to the matrices being sampled/measured, following accepted test methods. This testing is performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.
Field of Accreditation	TNI- Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.
Field of Proficiency Testing (FoPT)	TNI- Matrix, technology/method, analyte combinations for which the composition, spike concentration ranges and acceptance criteria have been established by the PTPEC.

Finding	TNI- An assessment conclusion referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement. DoD- An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive, negative, or neutral and is normally accompanied by specific examples of the observed condition. The finding must be linked to a specific requirement (e.g., this standard, ISO requirements, analytical methods, contract specifications, or laboratory management systems requirements).
Flame Atomic Absorption Spectrometer (FAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the fact that ground state metals absorb light at different wavelengths. Metals in a solution are converted to the atomic state by use of a flame.
Flame Ionization Detector (FID)	A type of gas detector used in GC analysis where samples are passed through a flame which ionizes the sample so that various ions can be measured.
Gas Chromatography (GC)	Instrumentation which utilizes a mobile carrier gas to deliver an environmental sample across a stationary phase with the intent to separate compounds out and measure their retention times.
Gas Chromatograph/ Mass Spectrometry (GC/MS)	In conjunction with a GC, this instrumentation utilizes a mass spectrometer which measures fragments of compounds and determines their identity by their fragmentation patterns (mass spectra).
Gasoline Range Organics (GRO)	A range of compounds that denote all the characteristic compounds that make up gasoline (range can be state or program specific).
Graphite Furnace Atomic Absorption Spectrometry (GFAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the absorption of light at different wavelengths that are characteristic of different analytes.
High Pressure Liquid Chromatography (HPLC)	Instrumentation used to separate, identify and quantitate compounds based on retention times which are dependent on interactions between a mobile phase and a stationary phase.
Holding Time	TNI- The maximum time that can elapse between two specified activities. 40 CFR Part 136- The maximum time that samples may be held prior to preparation and/or analysis as defined by the method and still be considered valid or not compromised. For sample prep purposes, hold times are calculated using the time of the start of the preparation procedure. DoD- The maximum time that may elapse from the time of sampling to the time of preparation or analysis, or from preparation to analysis, as appropriate.
Homogeneity	The degree to which a property or substance is uniformly distributed throughout a sample.
Homologue	One in a series of organic compounds in which each successive member has one more chemical group in its molecule than the next preceding member. For instance, methanol, ethanol, propanol, butanol, etc., form a homologous series.
Improper Actions	DoD- Intentional or unintentional deviations from contract-specified or method-specified analytical practices that have not been authorized by the customer (e.g., DoD or DOE).
Incremental Sampling Method (ISM)	Soil preparation for large volume (1 kg or greater) samples.

In-Depth Data Monitoring	TNI- When used in the context of data integrity activities, a review and evaluation of documentation related to all aspects of the data generation process that includes items such as preparation, equipment, software, calculations, and quality controls. Such monitoring shall determine if the laboratory uses appropriate data handling, data use and data reduction activities to support the laboratory's data integrity policies and procedures.
Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)	Analytical technique used for the detection of trace metals which uses plasma to produce excited atoms that emit radiation of characteristic wavelengths.
Inductively Coupled Plasma- Mass Spectrometry (ICP/MS)	An ICP that is used in conjunction with a mass spectrometer so that the instrument is not only capable of detecting trace amounts of metals and non-metals but is also capable of monitoring isotopic speciation for the ions of choice.
Infrared Spectrometer (IR)	An instrument that uses infrared light to identify compounds of interest.
Initial Calibration (ICAL)	The process of analyzing standards, prepared at specified concentrations, to define the quantitative response relationship of the instrument to the analytes of interest. Initial calibration is performed whenever the results of a calibration verification standard do not conform to the requirements of the method in use or at a frequency specified in the method.
Initial Calibration Blank (ICB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method. This blank is specifically run in conjunction with the Initial Calibration Verification (ICV) where applicable.
Initial Calibration Verification (ICV)	DoD- Verifies the initial calibration with a standard obtained or prepared from a source independent of the source of the initial calibration standards to avoid potential bias of the initial calibration.
Injection Internal Standard Analyte	Isotopically labeled analogs of analytes of interest (or similar in physiochemical properties to the target analytes but with a distinct response) to be quantitated. Added to all blanks, standards, samples and batch QC after extraction and prior to analysis.
Instrument Blank	A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination.
Instrument Detection Limits (IDLs)	Limits determined by analyzing a series of reagent blank analyses to obtain a calculated concentration. IDLs are determined by calculating the average of the standard deviations of three runs on three non-consecutive days from the analysis of a reagent blank solution with seven consecutive measurements per day.
Interference, spectral	Occurs when particulate matter from the atomization scatters incident radiation from the source or when the absorption or emission from an interfering species either overlaps or is so close to the analyte wavelength that resolution becomes impossible.
Interference, chemical	Results from the various chemical processes that occur during atomization and later the absorption characteristics of the analyte.
Internal Standard	TNI and DoD- A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.

International Organization for Standardization (ISO)	An international standard-setting body composed of representatives from various national standards organizations.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.
International System of Units (SI)	The coherent system of units adopted and recommended by the General Conference on Weights and Measures.
Ion Chromatography (IC)	Instrumentation or process that allows the separation of ions and molecules based on the charge properties of the molecules.
Isomer	One of two or more compounds, radicals, or ions that contain the same number of atoms of the same element but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.
Laboratory	A body that calibrates and/or tests.
Laboratory Control Sample (LCS)	TNI- (also known as laboratory fortified blank (LFB), spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes and taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to evaluate the performance of all or a portion of the measurement system.
Laboratory Duplicate	Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.
Laboratory Information Management System (LIMS)	DoD- The entirety of an electronic data system (including hardware and software) that collects, analyzes, stores, and archives electronic records and documents.
LabTrack	Database used by Pace to store and track corrective actions and other laboratory issues.
Learning Management System (LMS)	A web-based database used by the laboratories to track and document training activities. The system is administered by the corporate training department and each laboratory's learn centers are maintained by a local administrator.
Legal Chain-of-Custody Protocols	TNI- Procedures employed to record the possession of samples from the time of sampling through the retention time specified by the client or program. These procedures are performed at the special request of the client and include the use of a Chain-of-Custody (COC) Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory.
Limit(s) of Detection (LOD)	TNI- The minimum result, which can be reliably discriminated from a blank with predetermined confidence level. DoD- The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. At the LOD, the false negative rate (Type II error) is 1%. A LOD may be used as the lowest concentration for reliably reporting a non-detect of a specific analyte in a specific matrix with a specific method at 99% confidence.

Limit(s) of Quantitation (LOQ)	TNI- The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. DoD- The smallest concentration that produces a quantitative result with known and recorded precision and bias. For DoD/DOE projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard and within the calibration range.
Linear Dynamic Range	DoD- Concentration range where the instrument provides a linear response.
Liquid chromatography/ tandem mass spectrometry (LC/MS/MS)	Instrumentation that combines the physical separation techniques of liquid chromatography with the mass analysis capabilities of mass spectrometry.
Lot	TNI- A definite amount of material produced during a single manufacturing cycle, and intended to have uniform character and quality.
Management	Those individuals directly responsible and accountable for planning, implementing, and assessing work.
Management System	System to establish policy and objectives and to achieve those objectives.
Manager (however named)	The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual.
Matrix	TNI- The substrate of a test sample.
Matrix Duplicate	TNI- A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.
Matrix Spike (MS) (spiked sample or fortified sample)	TNI- A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.
Matrix Spike Duplicate (MSD) (spiked sample or fortified sample duplicate)	TNI- A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.
Measurement Performance Criteria (MPC)	DoD- Criteria that may be general (such as completion of all tests) or specific (such as QC method acceptance limits) that are used by a project to judge whether a laboratory can perform a specified activity to the defined criteria.
Measurement Quality Objective (MQO)	TNI- The analytical data requirements of the data quality objectives are project- or program-specific and can be quantitative or qualitative. MQOs are measurement performance criteria or objectives of the analytical process. Examples of quantitative MQOs include statements of required analyte detectability and the uncertainty of the analytical protocol at a specified radionuclide activity, such as the action level. Examples of qualitative MQOs include statements of the required specificity of the analytical protocol, e.g., the ability to analyze for the radionuclide of interest given the presence of interferences.

Measurement System	TNI- A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s). DoD- A test method, as implemented at a particular laboratory, and which includes the equipment used to perform the sample preparation and test and the operator(s).
Measurement Uncertainty	DoD- An estimate of the error in a measurement often stated as a range of values that contain the true value within a certain confidence level. The uncertainty generally includes many components which may be evaluated from experimental standard deviations based on repeated observations or by standard deviations evaluated from assumed probability distributions based on experience or other information. For DoD/DOE, a laboratory's Analytical Uncertainty (such as use of LCS control limits) can be reported as the minimum uncertainty.
Method	TNI- A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.
Method Blank	TNI- A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.
Method Detection Limit (MDL)	TNI- One way to establish a Detection Limit; defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
Method of Standard Additions	A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects. The procedures encompass the extrapolation back to obtain the sample concentration.
Minimum Detectable Activity (MDA)	TNI- Estimate of the smallest true activity that ensures a specified high confidence, $1 - \beta$, of detection above the Critical Value, and a low probability β of false negatives below the Critical Value. For radiometric methods, β is often set at 0.05. NOTE 1: The MDS is a measure of the detection capability of a measurement process and as such, it is an a priori concept. It may be used in the selection of methods to meet specified MQOs. Laboratories may also calculate a "sample specific" MDA, which indicates how well the measurement process is performing under varying real-world measurement conditions, when sample-specific characteristics (e.g., interferences) may affect the detection capability. However, the MDA must never be used instead of the Critical Value as a detection threshold. NOTE 2: For the purpose of this Standard, the terms MDA and minimum detectable concentration (MDC) are equivalent.
MintMiner	Program used by Pace to review large amounts of chromatographic data to monitor for errors or data integrity issues.

Mobile Laboratory	TNI- A portable enclosed structure with necessary and appropriate accommodation and environmental conditions for a laboratory, within which testing is performed by analysts. Examples include but are not limited to trailers, vans, and skid-mounted structures configured to house testing equipment and personnel.
National Environmental Laboratory Accreditation Conference (NELAC)	See definition of The NELAC Institute (TNI).
National Institute of Occupational Safety and Health (NIOSH)	National institute charged with the provision of training, consultation and information in the area of occupational safety and health.
National Institute of Standards and Technology (NIST)	TNI- A federal agency of the US Department of Commerce's Technology Administration that is designed as the United States national metrology institute (or NMI).
National Pollutant Discharge Elimination System (NPDES)	A permit program that controls water pollution by regulating point sources that discharge pollutants into U.S. waters.
Negative Control	Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.
Nitrogen Phosphorus Detector (NPD)	A detector used in GC analyses that utilizes thermal energy to ionize an analyte. With this detector, nitrogen and phosphorus can be selectively detected with a higher sensitivity than carbon.
Nonconformance	An indication or judgment that a product or service has not met the requirement of the relevant specifications, contract, or regulation; also the state of failing to meet the requirements.
Not Detected (ND)	The result reported for a compound when the detected amount of that compound is less than the method reporting limit.
Operator Aid	DoD- A technical posting (such as poster, operating manual, or notepad) that assists workers in performing routine tasks. All operator aids must be controlled documents (i.e., a part of the laboratory management system).
Performance Based Measurement System (PBMS)	An analytical system wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner.
Physical Parameter	TNI- A measurement of a physical characteristic or property of a sample as distinguished from the concentrations of chemical and biological components.
Photo-ionization Detector (PID)	An ion detector which uses high-energy photons, typically in the ultraviolet range, to break molecules into positively charged ions.
Polychlorinated Biphenyls (PCB)	A class of organic compounds that were used as coolants and insulating fluids for transformers and capacitors. The production of these compounds was banned in the 1970's due to their high toxicity.
Positive Control	Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.
Post-Digestion Spike	A sample prepared for metals analyses that has analytes spike added to determine if matrix effects may be a factor in the results.
Power of Hydrogen (pH)	The measure of acidity or alkalinity of a solution.

Practical Quantitation Limit (PQL)	Another term for a method reporting limit. The lowest reportable concentration of a compound based on parameters set up in an analytical method and the laboratory's ability to reproduce those conditions.
Precision	TNI- The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.
Preservation	TNI and DoD- Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis.
Primary Accreditation Body (Primary AB)	TNI- The accreditation body responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Procedure	TNI- A specified way to carry out an activity or process. Procedures can be documented or not.
Proficiency Testing (PT)	TNI- A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Program (PT Program)	TNI- The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories.
Proficiency Testing Provider (PT Provider)	TNI- A person or organization accredited by a TNI-approved Proficiency Testing Provider Accreditor to operate a TNI-compliant PT Program.
Proficiency Testing Provider Accreditor (PTPA)	TNI- An organization that is approved by TNI to accredit and monitor the performance of proficiency testing providers.
Proficiency Testing Reporting Limit (PTRL)	TNI- A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.
Proficiency Testing Sample (PT)	TNI- A sample, the composition of which is unknown to the laboratory, and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.
Proficiency Testing (PT) Study	TNI- a) Scheduled PT Study: A single complete sequence of circulation and scoring of PT samples to all participants in a PT program. The study must have the same pre-defined opening and closing dates for all participants; b) Supplemental PT Study: A PT sample that may be from a lot previously released by a PT Provider that meets the requirements for supplemental PT samples given in Volume 3 of this Standard [TNI] but that does not have a pre-determined opening date and closing date.
Proficiency Testing Study Closing Date	TNI- a) Scheduled PT Study: The calendar date by which all participating laboratories must submit analytical results for a PT sample to a PT Provider; b) Supplemental PT Study: The calendar date a laboratory submits the results for a PT sample to the PT Provider.
Proficiency Testing Study Opening Date	TNI- a) Scheduled PT Study: The calendar date that a PT sample is first made available to all participants of the study by a PT Provider; b) Supplemental PT Study: The calendar date the PT Provider ships the sample to a laboratory.

Protocol	TNI- A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) that must be strictly followed.
Qualitative Analysis	DoD- Analysis designed to identify the components of a substance or mixture.
Quality Assurance (QA)	TNI- An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
Quality Assurance Manual (QAM)	A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality Assurance Project Plan (QAPP)	A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.
Quality Control (QC)	TNI- The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.
Quality Control Sample (QCS)	TNI- A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control.
Quality Manual	TNI- A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality System	TNI and DoD- A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance and quality control activities.

Quality System Matrix	TNI and DoD- These matrix definitions shall be used for purposes of batch and quality control requirements and may be different from a field of accreditation matrix: • **Air and Emissions**: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device • **Aqueous**: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, groundwater effluents, and TCLP or other extracts. • **Biological Tissue**: Any sample of a biological origin such as fish tissue, shellfish or plant material. Such samples shall be grouped according to origin. • **Chemical Waste**: A product or by-product of an industrial process that results in a matrix not previously defined. • **Drinking Water**: Any aqueous sample that has been designated a potable or potentially potable water source. • **Non-aqueous liquid**: Any organic liquid with <15% settleable solids • **Saline/Estuarine**: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake. • **Solids**: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.
Quantitation Range	DoD- The range of values (concentrations) in a calibration curve between the LOQ and the highest successively analyzed initial calibration standard used to relate instrument response to analyte concentration. The quantitation range (adjusted for initial sample volume/weight, concentration/dilution and final volume) lies within the calibration range.
Quantitative Analysis	DoD- Analysis designed to determine the amounts or proportions of the components of a substance.
Random Error	The EPA has established that there is a 5% probability that the results obtained for any one analyte will exceed the control limits established for the test due to random error. As the number of compounds measured increases in a given sample, the probability for statistical error also increases.
Raw Data	TNI- The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.
Reagent Blank (method reagent blank)	A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.
Reagent Grade	Analytical reagent (AR) grade, ACS reagent grade, and reagent grade are synonymous terms for reagents that conform to the current specifications of the Committee on Analytical Reagents of the American Chemical Society.
Records	DoD- The output of implementing and following management system documents (e.g., test data in electronic or hand-written forms, files, and logbooks).

Reference Material	TNI- Material or substance one or more of whose property values are sufficiently homogenized and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Method	TNI- A published method issued by an organization generally recognized as competent to do so. (When the ISO language refers to a "standard method", that term is equivalent to "reference method"). When a laboratory is required to analyze by a specified method due to a regulatory requirement, the analyte/method combination is recognized as a reference method. If there is no regulatory requirement for the analyte/method combination, the analyte/method combination is recognized as a reference method if it can be analyzed by another reference method of the same matrix and technology.
Reference Standard	TNI- Standard used for the calibration of working measurement standards in a given organization or at a given location.
Relative Percent Difference (RPD)	A measure of precision defined as the difference between two measurements divided by the average concentration of the two measurements.
Reporting Limit (RL)	The level at which method, permit, regulatory and customer-specific objectives are met. The reporting limit may never be lower than the Limit of Detection (i.e., statistically determined MDL). Reporting limits are corrected for sample amounts, including the dry weight of solids, unless otherwise specified. There must be a sufficient buffer between the Reporting Limit and the MDL. DoD- A customer-specified lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.
Reporting Limit Verification Standard (RLVS)	A standard analyzed at the reporting limit for an analysis to verify the laboratory's ability to report to that level.
Representativeness	A quality element related to the ability to collect a sample reflecting the characteristics of the part of the environment to be assessed. Sample representativeness is dependent on the sampling techniques specified in the project work plan.
Requirement	Denotes a mandatory specification; often designated by the term "shall".
Retention Time	The time between sample injection and the appearance of a solute peak at the detector.
Revocation	TNI- The total or partial withdrawal of a laboratory's accreditation by an accreditation body.
Sample	Portion of material collected for analysis, identified by a single, unique alphanumeric code. A sample may consist of portions in multiple containers, if a single sample is submitted for multiple or repetitive analysis.
Sample Condition Upon Receipt Form (SCURF)	Form used by sample receiving personnel to document the condition of sample containers upon receipt to the laboratory (used in conjunction with a COC).
Sample Delivery Group (SDG)	A unit within a single project that is used to identify a group of samples for delivery. An SDG is a group of 20 or fewer field samples within a project, received over a period of up to 14 calendar days. Data from all samples in an SDG are reported concurrently.

Sample Receipt Form (SRF)	Letter sent to the client upon login to show the tests requested and pricing.
Sample Tracking	Procedures employed to record the possession of the samples from the time of sampling until analysis, reporting and archiving. These procedures include the use of a chain-of-custody form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples.
Sampling	TNI- Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.
Selected Ion Monitoring (SIM)	A mode of analysis in mass spectrometry where the detector is set to scan over a very small mass range, typically one mass unit. The narrower the range, the more sensitive the detector. DoD- Using GC/MS, characteristic ions specific to target compounds are detected and used to quantify in applications where the normal full scan mass spectrometry results in excessive noise.
Selectivity	TNI- The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system.
Sensitivity	TNI- The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Serial Dilution	The stepwise dilution of a substance in a solution.
Shall	Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification as long as the requirement is fulfilled.
Should	Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.
Signal-to-Noise Ratio (S/N)	DoD- A measure of signal strength relative to background noise. The average strength of the noise of most measurements is constant and independent of the magnitude of the signal. Thus, as the quantity being measured (producing the signal) decreases in magnitude, S/N decreases and the effect of the noise on the relative error of a measurement increases.
Source Water	TNI- When sampled for drinking water compliance, untreated water from streams, rivers, lakes, or underground aquifers, which is used to supply private and public drinking water supplies.
Spike	A known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.
Standard (Document)	TNI- The document describing the elements of a laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies.
Standard (Chemical)	Standard samples are comprised of a known amount of standard reference material in the matrix undergoing analysis. A standard reference material is a certified reference material produced by US NIST and characterized for absolute content, independent of analytical test method.

Standard Blank (or Reagent Blank)	A calibration standard consisting of the same solvent/reagent matrix used to prepare the calibration standards without the analytes. It is used to construct the calibration curve by establishing instrument background.
Standard Method	A test method issued by an organization generally recognized as competent to do so.
Standard Operating Procedure (SOP)	TNI- A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.
Standard Reference Material (SRM)	A certified reference material produced by the US NIST or other equivalent organization and characterized for absolute content, independent of analytical method.
Statement of Qualifications (SOQ)	A document that lists information about a company, typically the qualifications of that company to compete on a bid for services.
Stock Standard	A concentrated reference solution containing one or more analytes prepared in the laboratory using an assayed reference compound or purchased from a reputable commercial source.
Storage Blank	DoD- A sample of analyte-free media prepared by the laboratory and retained in the sample storage area of the laboratory. A storage blank is used to record contamination attributable to sample storage at the laboratory.
Supervisor	The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses.
Surrogate	DoD- A substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them for quality control purposes.
Suspension	TNI- The temporary removal of a laboratory's accreditation for a defined period of time, which shall not exceed 6 months or the period of accreditation, whichever is longer, in order to allow the laboratory time to correct deficiencies or area of non-conformance with the Standard.
Systems Audit	An on-site inspection or assessment of a laboratory's quality system.
Target Analytes	DoD- Analytes or chemicals of primary concern identified by the customer on a project-specific basis.
Technical Director	Individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory.
Technology	TNI- A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.
Test	A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate.
Test Method	DoD- A definitive procedure that determines one or more characteristics of a given substance or product.

Test Methods for Evaluating Solid Waste, Physical/ Chemical (SW-846)	EPA Waste's official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with RCRA regulations.
Test Source	TNI- A radioactive source that is tested, such as a sample, calibration standard, or performance check source. A Test Source may also be free of radioactivity, such as a Test Source counted to determine the subtraction background, or a short-term background check.
The NELAC Institute (TNI)	A non-profit organization whose mission is to foster the generation of environmental data of known and documented quality through an open, inclusive, and transparent process that is responsive to the needs of the community. Previously known as NELAC (National Environmental Laboratory Accreditation Conference).
Total Petroleum Hydrocarbons (TPH)	A term used to denote a large family of several hundred chemical compounds that originate from crude oil. Compounds may include gasoline components, jet fuel, volatile organics, etc.
Toxicity Characteristic Leaching Procedure (TCLP)	A solid sample extraction method for chemical analysis employed as an analytical method to simulate leaching of compounds through a landfill.
Traceability	TNI- The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical conditions or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Training Document	A training resource that provides detailed instructions to execute a specific method or job function.
Trip Blank	This blank sample is used to detect sample contamination from the container and preservative during transport and storage of the sample. A cleaned sample container is filled with laboratory reagent water and the blank is stored, shipped, and analyzed with its associated samples.
Tuning	A check and/or adjustment of instrument performance for mass spectrometry as required by the method.
Ultraviolet Spectrophotometer (UV)	Instrument routinely used in quantitative determination of solutions of transition metal ions and highly conjugated organic compounds.
Uncertainty, Counting	TNI- The component of Measurement Uncertainty attributable to the random nature of radioactive decay and radiation counting (often estimated as the square root of observed counts (MARLAP). Older references sometimes refer to this parameter as Error, Counting Error or Count Error (c.f., Total Uncertainty).

Uncertainty, Expanded	TNI- The product of the Standard Uncertainty and a coverage factor, k, which is chosen to produce an interval about the result that has a high probability of containing the value of the measurand (c.f., Standard Uncertainty). NOTE: Radiochemical results are generally reported in association with the Total Uncertainty. Either if these estimates of uncertainty can be reported as the Standard Uncertainty (one-sigma) or as an Expanded Uncertainty (k-sigma, where k > 1).
Uncertainty, Measurement	TNI- Parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measurand.
Uncertainty, Standard	TNI- An estimate of the Measurement Uncertainty expressed as a standard deviation (c.f., Expanded Uncertainty).
Uncertainty, Total	TNI- An estimate of the Measurement Uncertainty that accounts for contributions from all significant sources of uncertainty associated with the analytical preparation and measurement of a sample. Such estimates are also commonly referred to as Combined Standard Uncertainty or Total Propagated Uncertainty, and in some older references as the Total Propagated Error, among other similar items (c.f., Counting Uncertainty).
Unethical actions	DoD- Deliberate falsification of analytical or quality control results where failed method or contractual requirements are made to appear acceptable.
United States Department of Agriculture (USDA)	A department of the federal government that provides leadership on food, agriculture, natural resources, rural development, nutrition and related issues based on public policy, the best available science, and effective management.
United States Geological Survey (USGS)	Program of the federal government that develops new methods and tools to supply timely, relevant, and useful information about the Earth and its processes.
Unregulated Contaminant Monitoring Rule (UCMR)	EPA program to monitor unregulated contaminants in drinking water.
Validation	DoD- The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
Verification	TNI- Confirmation by examination and objective evidence that specified requirements have been met. In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.
Voluntary Action Program (VAP)	A program of the Ohio EPA that gives individuals a way to investigate possible environmental contamination, clean it up if necessary and receive a promise from the State of Ohio that no more cleanup is needed.
Whole Effluent Toxicity (WET)	The aggregate toxic effect to aquatic organisms from all pollutants contained in a facility's wastewater (effluent).

10.0. REFERENCES

10.1. "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act." Federal Register, 40 CFR Part 136, most current version.

10.2. "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods." SW-846.

10.3. "Methods for Chemical Analysis of Water and Wastes", EPA 600-4-79-020, 1979 Revised 1983, U.S. EPA.

10.4. U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis.

10.5. U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis.

10.6. "Standard Methods for the Examination of Water and Wastewater." Current Edition APHA-AWWA-WPCF.

10.7. "Annual Book of ASTM Standards", Section 4: Construction, Volume 04.04: Soil and Rock; Building Stones, American Society of Testing and Materials.

10.8. "Annual Book of ASTM Standards", Section 11: Water and Environmental Technology, American Society of Testing and Materials.

10.9. "NIOSH Manual of Analytical Methods", U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, most current version.

10.10. "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water", U.S. EPA, Environmental Monitoring and Support Laboratory – Cincinnati (Sep 1986).

10.11. Quality Assurance of Chemical Measurements, Taylor, John K.; Lewis Publishers, Inc. 1987.

10.12. Methods for Non-conventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079C.

10.13. Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300, US DOE, February, 1992.

10.14. Requirements for Quality Control of Analytical Data, HAZWRAP, DOE/HWP-65/R1, July, 1990.

10.15. Requirements for Quality Control of Analytical Data for the Environmental Restoration Program, Martin Marietta, ES/ER/TM-16, December, 1992.

10.16. Quality Assurance Manual for Industrial Hygiene Chemistry, AIHA, most current version.

10.17. National Environmental Laboratory Accreditation Conference (NELAC) Standard- most current version.

10.18. ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories- most current version.

10.19. Department of Defense Quality Systems Manual (QSM), most current version.

10.20. TNI (The NELAC Institute) Standard- most current version applicable to each lab.

10.21. UCMR Laboratory Approval Requirements and Information Document, most current version.

10.22. US EPA Drinking Water Manual, most current version.

11.0. REVISIONS

The Pace Corporate Environmental Quality Office files an electronic version of a Microsoft Word document with tracked changes detailing all revisions made to previous versions of the Quality Assurance Manual. This document is available upon request. All current revisions are summarized in the table below.

Document Number	Reason for Change	Date
Quality Assurance Manual 19.0	General: made administrative edits that do not affect the policies or procedures within the document (including revising company name to Pace Analytical Services, LLC). Cover page: removed corporate approval signature lines. Old Section 3: moved to other sections of the QAM as applicable and deleted entire section (All section references below reflect the new section numbers). Section 1.1.2: replaced with section 3.1.1. Sections 1.3, 1.4, 1.11: removed extraneous language. Sections 1.5: added language from old section 1.6. Section 1.6: revised anonymous reporting information. Section 1.7.6: added deputies per position and deleted DoD language from old section 1.7.7. Section 1.8: removed non-key personnel job descriptions. Section 2: rearranged existing sections. Section 2.4: reworded to match existing Sample Acceptance policy document. Section 4: in general, for each QC type, removed language regarding frequency and corrective actions and referenced lab-specific SOPs. Section 5: in general, removed extraneous language and Management of Change section. Section 5.1, 5.2: reorganized into Primary and Secondary Review sections and removed extraneous language. Section 6: removed extraneous language including Quarterly Report section. Section 9 (glossary): revised and added definitions based on 2016 TNI Standard. Section 10: Added EPA DW Manual and revised references as applicable. Attachment III: updated corporate organizational chart. Old Attachment IV: removed floor plan attachment. Old Attachment VII: removed COC (available in SOPs).	06Mar2017

ATTACHMENT I- QUALITY CONTROL CALCULATIONS

PERCENT RECOVERY (%REC)

$$\%REC = \frac{(MSConc - SampleConc)}{TrueValue} * 100$$

NOTE: The SampleConc is zero (0) for the LCS and Surrogate Calculations

PERCENT DIFFERENCE (%D)

$$\%D = \frac{MeasuredValue - TrueValue}{TrueValue} * 100$$

where:
TrueValue = Amount spiked (can also be the $\overline{CF}$ or $\overline{RF}$ of the ICAL Standards)
Measured Value = Amount measured (can also be the CF or RF of the CCV)

PERCENT DRIFT

$$\%Drift = \frac{Calculated\,Concentration - Theoretical\,Concentration}{Theoretical\,Concentrtion} * 100$$

RELATIVE PERCENT DIFFERENCE (RPD)

$$RPD = \frac{|(R1 - R2)|}{(R1 + R2)/2} * 100$$

where:
R1 = Result Sample 1
R2 = Result Sample 2

CORRELATION COEFFICIENT (R)

$$CorrCoeff = \frac{\sum_{i=1}^{N} W_i * (X_i - \overline{X}) * (Y_i - \overline{Y})}{\sqrt{\left(\sum_{i=1}^{N} W_i * (X_i - \overline{X})^2\right) * \left(\sum_{i=1}^{N} W_i * (Y_i - \overline{Y})^2\right)}}$$

With:		
	N	Number of standard samples involved in the calibration
	i	Index for standard samples
	Wi	Weight factor of the standard sample no. i
	Xi	X-value of the standard sample no. i
	X(bar)	Average value of all x-values
	Yi	Y-value of the standard sample no. i
	Y(bar)	Average value of all y-values

ATTACHMENT I- QUALITY CONTROL CALCULATIONS (CONTINUED)

STANDARD DEVIATION (S)

$$S = \sqrt{\sum_{i=1}^{n} \frac{(X_i - \overline{X})^2}{(n-1)}}$$

where:
n = number of data points
X_i = individual data point
$\overline{X}$ = average of all data points

AVERAGE ($\overline{X}$)

$$\overline{X} = \frac{\sum_{n=1}^{i} X_i}{n}$$

where:
n = number of data points
X_i = individual data point

RELATIVE STANDARD DEVIATION (RSD)

$$RSD = \frac{S}{\overline{X}} * 100$$

where:
S = Standard Deviation of the data points
$\overline{X}$ = average of all data points

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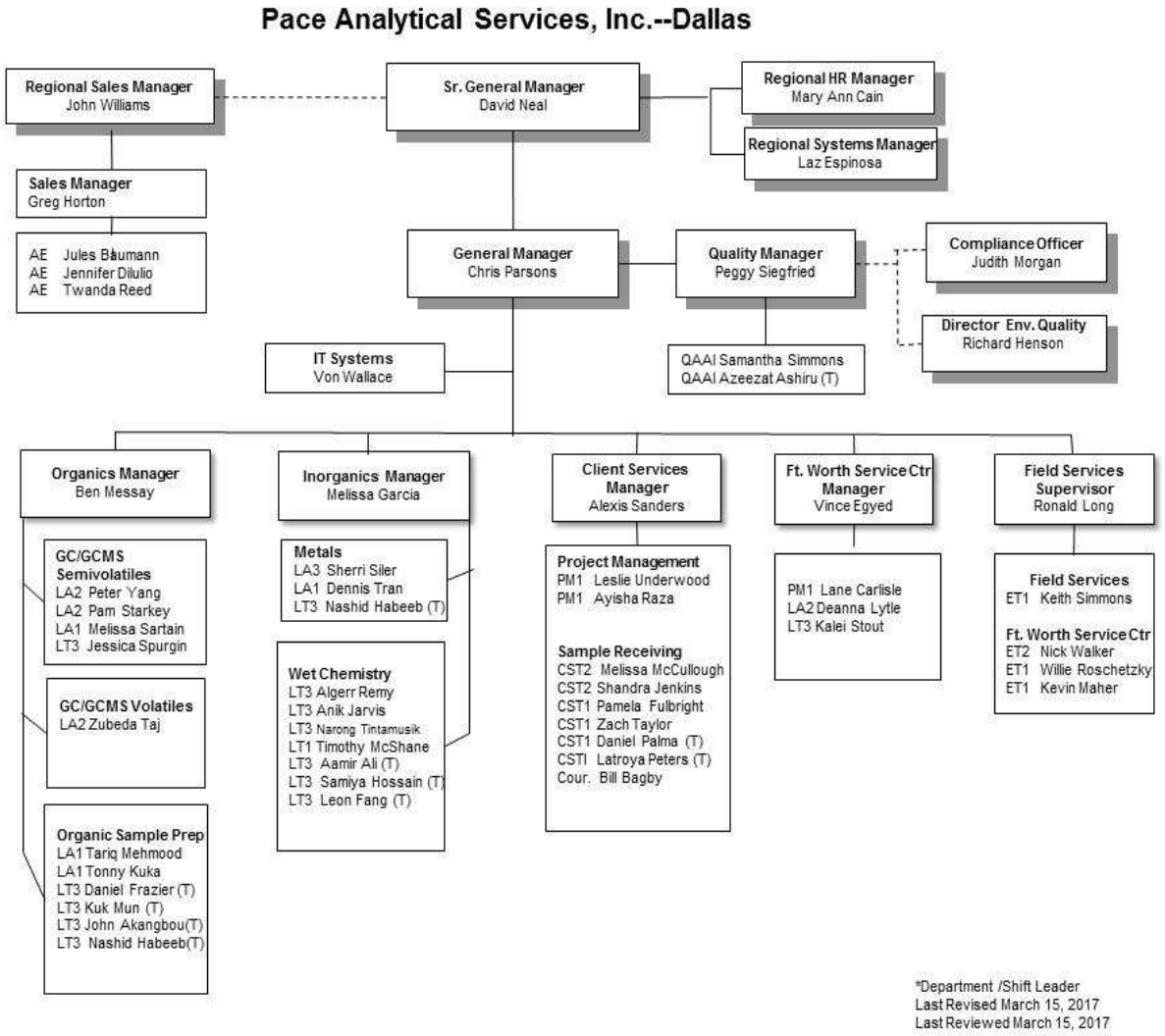
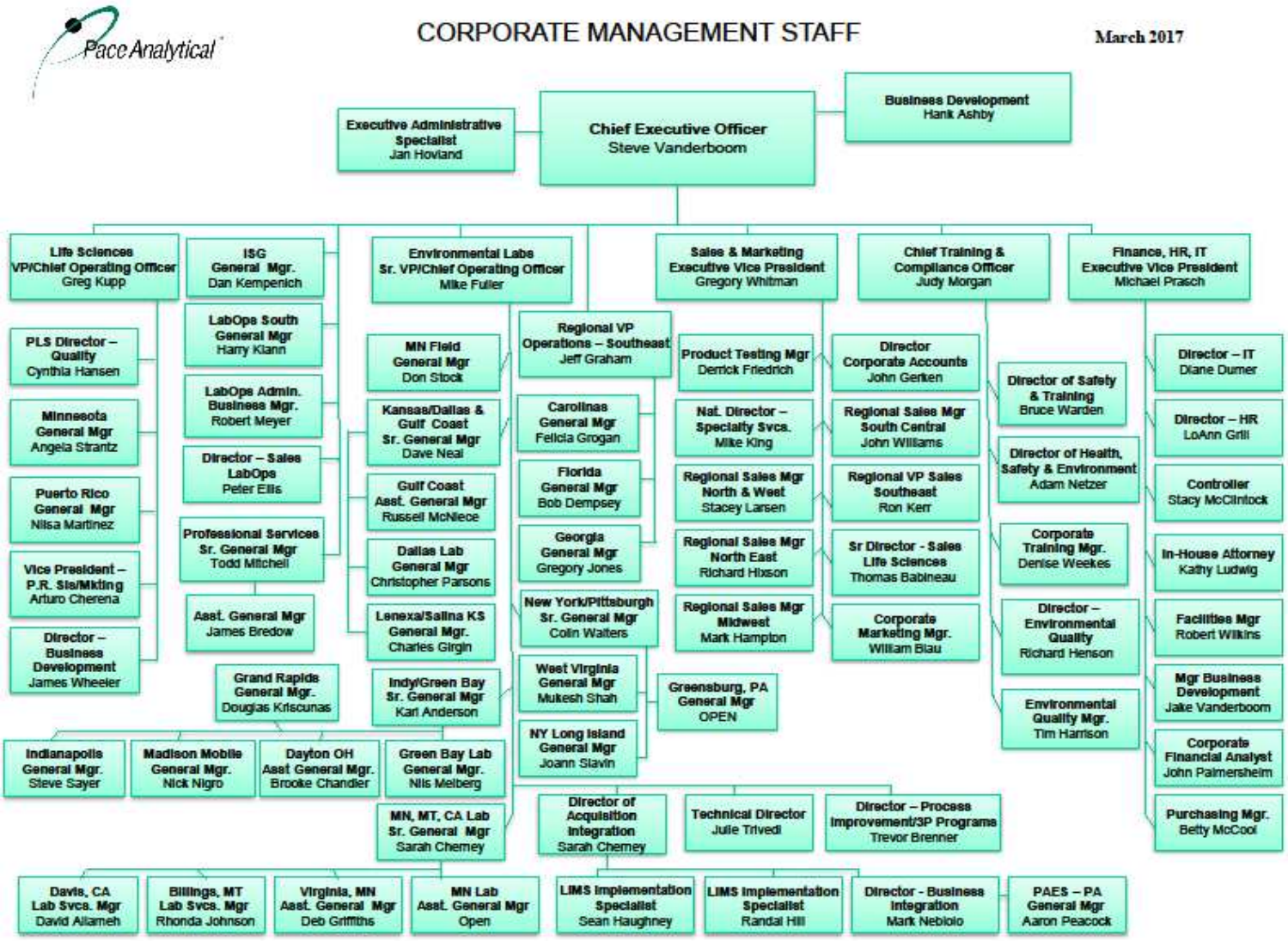
ATTACHMENT II- LABORATORY ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



ATTACHMENT III- CORPORATE ORGANIZATIONAL CHART (CURRENT AS OF ISSUE DATE)



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ATTACHMENT IV- EQUIPMENT LIST (CURRENT AS OF ISSUE DATE)

Pace Analytical Services- Dallas
List of Instruments

Instrument	Manufacturer	Model	S/N#	Pace Instrument ID	Analysis	Detector Model
Organics	Organics					
GCMS	Agilent/Archon	6890 (gc)	US00007964	75MSV2	Volatile	
		5973 (ms)	US71410462			quadrapole
GCMS	Agilent/Archon	6850 (gc)		75MSV4	Volatile	
		5975 (ms)	CN11042001			quadrapole
GCMS	Agilent/Archon	6890N (gc)	US1022009	75MSV5	Volatile	
		5973 (ms)	US10442855			
	Hewlett Packard/Atomx	6890 (gc)	US00007749	75MSV3	Volatile	quadrapole
		5973 (ms)				
	Perkin Elmer/	Clarus 600 (gc)		75MSV6	Volatile	
		Clarus 600 S (ms)	664N0012104			
GCMS	Agilent	6890 (gc)	US00008710	75MSS1	BNA	
		5973 (ms)	US72010560			quadrapole
GCMS	Agilent	6890 (gc)	US0007972	75MSS2	BNA	
		5973 (ms)	US71401468			quadrapole
GCMS	Agilent	6890 (gc)	US00034443	75MSS3	BNA	
		5973 (ms)	US30944978			quadrapole
GCMS	Agilent	7890 (gc)	CN13293074	75MSS4	BNA	
		5977 (ms)	US1328M213			quadrapole
GCMS	Perkin Elmer	Clarus 600(gc)		75MSS5		
		Clarus 600 S (ms)				
GCMS	Agilent	6890N (gc)	CN10319003	75MSS6		
		5973 (ms)	US30945746			
HPLC	Agilent HP1100 Series	Degasser	JP05032387	75HP1		
		QuatPump	US53600343			DAD/FLD-1100
		ALS	US72102405			
		ColCom	DE14925344			
GC	Agilent	6890N	US10335095	75GCS8		
GC	Agilent	6890N	US00020777			
GC	Agilent	6980	US00034115	75GS2A		Dual ECD
GC	Agilent	6890	US00005442	75GS3A		Dual ECD
GC	Agilent	6890	CN1082005			Dual FID
GC	Agilent	7890A	CN98205350	75GS5A		Dual FID
GC	Agilent	7890A	CN10814061	75GS6A		Dual FPD
GC	Agilent	6890	US00021061	75GS7A		ECD
GC	Agilent	6890	US00006494	75GCV2		FID/PID
Metals	Metals					
ICPMS	Agilent	7500	JP14100568	75ICM1		
ICPMS	Perkin Elmer	Elan DRC	F112001	75ICM2		
ICPMS	Perkin Elmer	Elan 9000	AJ13060910	75ICM3		
ICPMS	Agilent	7700	G3282A	75ICM4		
ICP	Thermo	ICAP 6000	ICP-20083606	75ICP1		
Mercury	CETAC	M-6100	606501	75HG1		
Mercury	CETAC	M-6100		75HG2		
	Env Express	TCLP Tumbler		75PRP7		
	Env Express	TCLP Tumbler		75PRP8		
	Env Express	TCLP Tumbler		75PRP9		
	Env Express	Hot Block		75DB2		
	Env Express	Hot Block		75DB3		
	Env Express	Hot Block		75DB4		
	Env Express	Hot Block		75DB5		

ATTACHMENT III- EQUIPMENT LIST CONT. (CURRENT AS OF ISSUE DATE)

Pace Analytical Services- Dallas
List of Instruments

Wet Chemistry	Wet Chem					
	Shimadzu	TOC Analyzer	H521050	75WTA9	TOC	
	Spectronic	Spec 20 4001/4	35GB014035	75WTA3		
	Teckmar	Phoenix 8000	99062006	75WTA1	TOC	
	Thermo - Dionex	ICS-1600	12080165	75WTA2	IC	
	Thermo- Dionex	ICS-1100	14100457	75WTA4	IC	
	Lachat		010803A410			
	HACH	HQ40d		75WETA	BOD	
	HACH	HQ40d		75WETJ	BOD	
	Therm Sci		LP115134	75WET4		
	Thermo	Orion 720 At	90907	75WET3	pH	
	Koehler	K16200	R070021104-B	75WETE	Flash Point	
	Skalar	BOD robot	16287	75WTAA	BOD	
Organic Prep	Organic Prep					
	LabConco		602945	75RV200	Rapid Vap	
	LabConco		258603	75RV199	Rapid Vap	
	Zymark		TV9743R7756	75TV122	TurboVap	
	Zymark		TV9806N7960	75TV123	TurboVap	
	Zymark		TV9906R8632	75TV155	TurboVap	
	Microwave			Mars X	Soil Extraction	
	GPC		J2	75GPC1	Cleanup	
	Thermo		SN209695-278		Water bath	

ATTACHMENT V- LABORATORY SOP LIST (CURRENT AS OF ISSUE DATE)

Department	PACE SOP No.	Revision	Document Name
O	S-ALL-O-038	2	Processing and Evaluating TICs for GCMS
Q	S-ALL-Q-003	10	Document Numbering
Q	S-ALL-Q-009	7	General Documentation
Q	S-ALL-Q-014	6	Quarterly Quality Report
Q	S-ALL-Q-015	3	Review of Laboratory Management System
Q	S-ALL-Q-020	6	Training and Employee Orientation
Q	S-ALL-Q-022	4	3P Program Continuous Process Improvement
Q	S-ALL-Q-028	4	Use and Operation of LabTrack
Q	S-ALL-Q-029	3	MintMiner Data File Review for Data Integrity Monitoring
Q	S-ALL-Q-030	5	Operation of Data Checker
Q	S-ALL-Q-035	3	Data Recall
S	S-ALL-S-001	5	Hazard Assessments
T	S-ALL-T-002	5	LMS Sub-Learn Center Sytems and Training Admin Resp
C	S-DAL-C-001	3	Sample Management
C	S-DAL-C-003	1	Subcontracting Samples
C	S-DAL-C-004	2	Bottle Preparation
C	S-DAL-C-006	1	Review of Analytical Requests
C	S-DAL-C-007	0	Customer Feedback Process
F	S-DAL-F-001	0	Wastewater Sampling Procedures
I	S-DAL-I-001	4	Alkalinity SM2320B/SM4500CO2-D
I	S-DAL-I-003	2	Phenolics, Total Recoverable 420.1/9065
I	S-DAL-I-004	3	Biochemical Oxygen Demand/CBOD SM5210B
I	S-DAL-I-005	2	Cyanide SM4500-CN C, E, G
I	S-DAL-I-007	4	Anions by IC 300.0/9056A
I	S-DAL-I-008	2	Total Organic Carbon SM5310C/9060A
I	S-DAL-I-009	2	Chemical Oxygen Demand SM5520D/Hach 8000
I	S-DAL-I-010	2	Hexavalent Chromium SM3500-Cr-B and 7196A
I	S-DAL-I-011	3	Reactive Cyanide and Sulfide SW846 Chap 7
I	S-DAL-I-012	2	Conductivity 120.1, 9050A
I	S-DAL-I-013	2	pH 4500H+B, 9040B, 9045C
I	S-DAL-I-014	2	Flashpoint 1010A
I	S-DAL-I-016	2	Cyanide 9010C/9014
I	S-DAL-I-017	3	Total Phosphorus SM4500-P-E
I	S-DAL-I-018	2	Total Dissolved Solids (TDS) SM2540 C
I	S-DAL-I-019	2	Sulfide and Hydrogen Sulfide SM4500-S2F
I	S-DAL-I-020	3	Total Suspended Solids (TSS) SM2540D
I	S-DAL-I-021	3	Total Solids (TS) SM2540B
I	S-DAL-I-022	3	Determination of Percent Moisture ASTM2974
I	S-DAL-I-023	2	Color SM2120B
I	S-DAL-I-024	2	Dissolved Oxygen SM4500-O-C and Hach 8215
I	S-DAL-I-026	2	Paint Filter Test 9095A
I	S-DAL-I-028	2	Specific Gravity SM2710F
I	S-DAL-I-030	2	Acidity SM2310B
I	S-DAL-I-032	2	Surfactants (MBAS) SM5540C
I	S-DAL-I-034	2	Ferrous Iron SM3500-Fe-D
I	S-DAL-I-035	2	Turbidity 180.1
I	S-DAL-I-036	2	Ignitability of Solids 1030
I	S-DAL-I-038	3	Settleable Solids SM2540F
I	S-DAL-I-039	3	Total Volatile Solids (TVS/TVSS) SM2540F and 160.4
I	S-DAL-I-044	2	Ammonia Nitrogen by ISE (Distilled) SM4500-NH3B/D
I	S-DAL-I-045	0	Determination of UV Absorbing Organic Constituents SM5910B
I	S-DAL-I-046	1	Ammonia Nitrogen by FIA SM4500-NH3-H
I	S-DAL-I-047	0	Orthophosphate SM4500-P-E
I	S-DAL-I-048	1	Nitrate and Nitrite by FIA EPA 353.2
I	S-DAL-I-049	0	TKN by FIA SM4500 Norg-D

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ATTACHMENT V- LABORATORY SOP LIST CONT. (CURRENT AS OF ISSUE DATE)

Pace Dallas SOP Tracking Sheet

M	S-DAL-M-001	4	ICP 200.7 and 6010B
M	S-DAL-M-004	3	Hot Block Acid Digestion of Aqueous Samples for Analysis by ICP and ICPMS; 3010A, 3005A, 200.7, 200.8
M	S-DAL-M-005	2	ICP-MS 200.8 and 6020A
M	S-DAL-M-006	3	Hot Block Digestion of Solids for Total Metals by ICP and ICPMS 3050B
M	S-DAL-M-007	2	Mercury in Solids, waste and Aqueous by SW-846 Methods 7471B, 245.1 and 7470A
M	S-DAL-M-014	2	SPLP non-volatiles 1312
M	S-DAL-M-015	2	TCLP (Non-volatile) 1311
M	S-DAL-M-016	1	7-Day Leachate
MB	S-DAL-MB-001	2	Media and Component Sterility Verification
MB	S-DAL-MB-002	2	E. Coli by Colilert Quanti-Tray
MB	S-DAL-MB-003	3	Fecal Coliform (MF) SM9222D
MB	S-DAL-MB-004	2	Heterotrophic Plate Count SM9215B
MB	S-DAL-MB-006	2	Total Coliform (MF) SM9222B
MB	S-DAL-MB-007	2	Fecal Coliform (MPN) SM9221E and Hach 10028
MB	S-DAL-MB-009	0	Determination of Chlorophyll A SM10200-H
MB	S-DAL-MB-010	0	Determination of Phytoplankton SM10200-F
MB	S-DAL-MB-011	0	Identification of Aquatic Organisms SM10900
MB	S-DAL-MB-012	0	QC and Maintenance for Microbiology
MB	S-DAL-MB-013	0	HPC by SimPlate SM 9215E
O	S-DAL-O-001	4	Volatiles GC/MS - Water & Soil- 8260B/624/524.2
O	S-DAL-O-002	2	Base Neutrals & Acids (GC/MS)- 8270C & 625
OP	S-DAL-O-005	2	Separatory Funnel Extraction 3510C
OP	S-DAL-O-007	1	Waste Dilution 3580A
OP	S-DAL-O-008	1	Extraction of Herbicides in Soil/Water by 8151A/3546
OP	S-DAL-O-009	1	Herbicide Extraction 615 Sep Funnel Extraction
OP	S-DAL-O-010	4	TX1005/1006 Soil and Water Extraction
OP	S-DAL-O-014	0	Diazomethane Preparation
OP	S-DAL-O-017	0	OP Pesticides Water Extraction 1657
OP	S-DAL-O-018	0	Carbamate by Sep Funnel Extraction 8318A
O	S-DAL-O-023	2	Acrylamides by HPLC 8316
O	S-DAL-O-025	2	Chlorophenoxy Acid Herbicides 8151A/615
O	S-DAL-O-026	1	OP Pesticides 8141A/1657A/614
O	S-DAL-O-027	1	PCBs 8082/608
O	S-DAL-O-028	1	DRO analysis (OA2/8015B/OK DRO)
O	S-DAL-O-029	2	TNRCC Method 1005/1006 TPH
O	S-DAL-O-030	1	Analysis of Hexachlorophene and Selected Carbamates by HPLC by Methods 604.1 & 632
O	S-DAL-O-033	0	Purgeable Aromatics and GRO- Aqueous & Soil- 602, OK GRO, 5030B/5035, 8015M, 8021B
O	S-DAL-O-035	1	Alcohol, Glycols and Glycol Ethers Based on Method 8015M by GCFID
O	S-DAL-O-036	1	Carbamates by HPLC 8318A
O	S-DAL-O-042	1	VOCs by Isotope Dilution 1666
OP	S-DAL-O-043	1	SPLP/TCLP ZHE Based on EPA Methods 1311 & 1312
OP	S-DAL-O-044	1	n-Hexane Extractable Material 1664A
OP	S-DAL-O-045	1	Microwave Extraction 3546
O	S-DAL-O-046	1	Organochlorine Pesticides 8081A/617/608
Q	S-DAL-Q-001	2	Preparation of Standard Operating Procedures
Q	S-DAL-Q-002	2	Document Control and Management
Q	S-DAL-Q-004	0	Determination of LOD and LOQ
Q	S-DAL-Q-005	0	Purchasing Lab Supplies
Q	S-DAL-Q-006	0	Receipt and Storage of Lab Supplies
Q	S-DAL-Q-010	1	Proficiency Testing Program
Q	S-DAL-Q-011	0	Internal and External Audits
Q	S-DAL-Q-012	0	Corrective and Preventive Actions
Q	S-DAL-Q-013	1	Support Equipment
Q	S-DAL-Q-016	3	Manual Integration
Q	S-DAL-Q-018	4	Monitoring Temperature Controlled Units
Q	S-DAL-Q-021	1	Sample Homogenization and Subsampling
Q	S-DAL-Q-025	7	Standards and Reagent Traceability
Q	S-DAL-Q-026	1	Spreadsheet Validation
Q	S-DAL-Q-027	1	Evaluation and Qualification of Vendors
Q	S-DAL-Q-031	1	Estimation of Measurement Uncertainty
Q	S-DAL-Q-032	0	Control Chart and Control Limits

ATTACHMENT V- LABORATORY SOP LIST CONT. (CURRENT AS OF ISSUE DATE)

Pace Dallas SOP Tracking Sheet

Q	S-DAL-Q-036	0	Management of Change
Q	S-DAL-Q-037	1	Data Review Process
Q	S-DAL-Q-038	1	Glassware Cleaning
S	S-DAL-S-002	1	Air Quality and Fume Hood Monitoring
S	S-DAL-S-003	2	Regulated Soil Handling
W	S-DAL-W-002	1	Waste Handling and Management
W	S-DAL-W-003	1	Waste Management Training Requirements

ATTACHMENT VI- LABORATORY CERTIFICATION LIST (CURRENT AS OF ISSUE DATE)
SCOPE AND APPLICATION CERTIFICATES ARE MAINTAINED AND FILED IN THE LOCAL QUALITY DEPARTMENT

State/Agency	Certification #	Program	Expiration Date
Arkansas DEQ	88-0647	Non-Potable Water	1/9/2018
Arkansas DEQ	88-0648	Solid Chemical Material	1/9/2018
Florida DOH	E871118	Non-Potable Water	6/30/2017
Florida DOH	E871118	Solid Chemical Material	6/30/2017
Iowa DNR	408	Solid Waste/Contaminated Sites	11/1/2017
Kansas DHE	E-10388	Non-Potable Water	10/31/2017
Kansas DHE	E-10388	Solid Chemical Material	10/31/2017
Lousiana DEQ	30686	Non-Potable Water	6/30/2017
Lousiana DEQ	30686	Solid Chemical Material	6/30/2017
Oklahoma DEQ	8727	Non-Potable Water	8/31/2017
Oklahoma DEQ	8727	Solid Chemical Material	8/31/2017
Texas CEQ	T104704232	Potable Water	6/30/2017
Texas CEQ	T104704232	Non-Potable Water	6/30/2017
Texas CEQ	T104704232	Solid Chemical Material	6/30/2017
USDA Soil Permit	P330-16-00280	Regulated Soils	8/20/2019

ATTACHMENT VII- METHOD HOLD TIME, CONTAINER AND PRESERVATION GUIDE (CURRENT AS OF ISSUE DATE)

THE HOLDING TIME INDICATED IN THE CHART BELOW IS THE MAXIMUM ALLOWABLE TIME FROM COLLECTION TO EXTRACTION AND/OR ANALYSIS PER THE ANALYTICAL METHOD. FOR METHODS THAT REQUIRE PROCESSING PRIOR TO ANALYSIS, THE HOLDING TIME IS DESIGNATED AS 'PREPARATION HOLDING TIME/ANALYSIS HOLDING TIME'.

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Acid Base Accounting	Sobek	Solid	Plastic/Glass	None	N/A
Acidity	SM2310B	Water	Plastic/Glass	≤ 6ºC	14 Days
Acid Volatile Sulfide	Draft EPA 1629	Solid	8oz Glass	≤ 6ºC	14 Days
Actinides	HASL-300	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Actinides	HASL-300	Solid	Plastic/Glass	None	180 Days
Alkalinity	SM2320B/310.2	Water	Plastic/Glass (NY requires separate bottle filled to the exclusion of air)	≤ 6ºC	14 Days
Alkylated PAHs		Water	1L Amber Glass	≤ 6ºC; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved
Alkylated PAHs		Solid	8oz Glass	≤ 10ºC	1 Year/40 Days
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0/300.1/SM4110B	Water	Plastic/Glass	≤ 6ºC; EDA if bromate or chlorite run	All analytes 28 days except: NO_2, NO_3, o-Phos (48 Hours); chlorite (immediately for 300.0; 14 Days for 300.1). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4, bromate, chlorite, chlorate)	300.0	Solid	Plastic/Glass	≤ 6ºC	All analytes 28 days except: NO_2, NO_3, o-Phos (48

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
					hours); chlorite (immediately). NO_2/NO_3 combo 28 days.
Anions (Br, Cl, F, NO_2, NO_3, o-Phos, SO_4	9056	Water/ Solid	Plastic/Glass	$\leq$ 6ºC	48 hours
Aromatic and Halogenated Volatiles (see note 1)	8021	Solid	5035 vial kit	See note 1	14 days
Aromatic and Halogenated Volatiles	602/8021	Water	40mL vials	pH<2 HCl; $\leq$ 6ºC; $Na_2S_2O_3$ if Cl present	14 Days (7 Days for aromatics if unpreserved)
Asbestos	EPA 600/R-93/116	Solid	Plastic/Glass; bulk- 2" square; popcorn ceiling- 2tbsp; soil- 4oz	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Bacteria, Total Plate Count	SM9221D	Water	Plastic/WK	$\leq$ 6ºC; $Na_2S_2O_3$	24 Hours
Base/Neutrals and Acids	8270	Solid	8oz Glass	$\leq$ 6ºC	14/40 Days
Base/Neutrals and Acids	625/8270	Water	1L Amber Glass	$\leq$ 6ºC; $Na_2S_2O_3$ if Cl present	7/40 Days
Base/Neutrals, Acids & Pesticides	525.2	Water	1L Amber Glass	pH<2 HCl; $\leq$ 6ºC; Na sulfite if Cl present	14/30 Days
Biomarkers		Water	$\leq$ 6ºC; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	$\leq$ 6ºC; pH<2 1:1 HCl (optional)
Biomarkers		Solid	$\leq$ 10ºC	1 Year/40 Days	$\leq$ 10ºC
BOD/cBOD	SM5210B	Water	Plastic/Glass	$\leq$ 6ºC	48 hours
Boiling Range Distribution of Petroleum Fractions	ASTM D2887-98	Product	10mL glass vials	$\leq$ 6ºC	N/A
BTEX/Total Hydrocarbons	TO-3	Air	Summa Canister	None	28 Days
BTEX/Total Hydrocarbons	TO-3	Air	Tedlar Bag or equivalent	None	72 Hours
Carbamates	531.1	Water	Glass	$Na_2S_2O_3$,	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
				Monochloroacetic acid pH <3; ≤ 6ºC	
Carbamates	8318	Water	Glass	Monochloroacetic acid pH 4-5; ≤ 6ºC	7/40 Days
Carbamates	8318	Solid	Glass	≤ 6ºC	7/40 Days
Carbon Specific Isoptope Analysis (CSIA)	AM24	Water	40mL clear VOA vial with TLS	≤ 6ºC, trisodium phosphate or HCl	N/A
Cation/Anion Balance	SM1030E	Water	Plastic/Glass	None	None
Cation Exchange	9081	Solid	8oz Glass	None	unknown
Cations (Ferrous Iron, Ferric Iron, Divalent Manganese)	7199 modified	Water	40mL clear VOA vials with mylar septum	≤ 6ºC; HCl	48 Hours
Chloride	SM4500Cl-C,E	Water	Plastic/Glass	None	28 Days
Chlorinated Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A
Chlorine, Residual	SM4500Cl-D,E,G/330.5/Hach 8167	Water	Plastic/Glass	None	15 minutes
Chlorophyll	SM10200H	Water	Opaque bottle or aluminum foil	≤ 6ºC	48 Hours to filtration
COD	SM5220C, D/410.4/Hach 8000	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6ºC	28 Days
Coliform, Fecal	SM9222D	Water	100mL Plastic	≤ 10ºC; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9222D	Solid	100mL Plastic	≤ 10ºC; $Na_2S_2O_3$	24 Hours
Coliform, Fecal	SM9221E	Water	100mL Plastic	≤ 10ºC; $Na_2S_2O_3$	8 Hours
Coliform, Fecal	SM9221E	Solid	100mL Plastic	≤ 10ºC; $Na_2S_2O_3$	24 Hours
Coliform, Total	SM9222B	Water	100mL Plastic	≤ 10ºC; $Na_2S_2O_3$	8 Hours
Coliform, Total	SM9221B	Solid	100mL Plastic	≤ 10ºC; $Na_2S_2O_3$	8 Hours
Coliform, Total, Fecal and E. coli	Colilert/ Quanti-tray	Water	100mL Plastic	≤ 10ºC; $Na_2S_2O_3$	8 Hours
Coliform, Total and E. coli	SM9223B	Drinking Water	100mL Plastic	≤ 10ºC; $Na_2S_2O_3$	30 Hours
Color	SM2120B,E	Water	Covered	≤ 6ºC	48 Hours

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
			Plastic/Acid Washed Amber Glass		
Condensable Particulate Emissions	EPA 202	Air	Solutions	None	180 Days
Cyanide, Reactive	SW846 chap.7	Water	Plastic/Glass	None	28 Days
Cyanide, Reactive	SW846 chap.7	Solid	Plastic/Glass	None	28 Days
Cyanide, Total and Amenable	SM4500CN-A,B,C,D,E,G,I,N/9010/ 9012/335.4	Water	Plastic/Glass	pH≥12 NaOH; ≤ 6ºC; ascorbic acid if Cl present	14 Days (24 Hours if sulfide present-applies to SM4500CN only)
Diesel Range Organics- Alaska DRO	AK102	Solid	8oz Glass	≤ 6ºC	14/40 Days
Diesel Range Organics- Alaska DRO	AK102	Water	1L Glass	pH<2 HCl; ≤ 6ºC	14/40 Days
Diesel Range Organics- TPH DRO	8015	Solid	8oz Glass Jar	≤ 6ºC	14/40 Days
Diesel Range Organics- TPH DRO	8015	Water	1L Amber Glass	≤ 6ºC; $Na_2S_2O_3$ if Cl present	7/40 Days
Diesel Range Organics- TPH DRO	8015	Tissue	1L Amber Glass	≤ - 10ºC	1 Year if frozen/40 Days
Diesel Range Organics- TPH DRO	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6ºC but above freezing	28 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Solid	8oz Glass Jar	≤ 6ºC	14/40 Days
Diesel Range Organics- NwTPH-Dx	Nw-TPH-Dx	Water	1L Amber Glass	pH <2 HCl; ≤ 6ºC	14/40 Days; 7 Days from collection to extraction if unpreserved
Diesel Range Organics- Wisconsin	WI MOD DRO	Solid	Tared 4oz Glass Jar	≤ 6ºC	10/47 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
DRO					
Diesel Range Organics- Wisconsin DRO	WI MOD DRO	Water	1L Amber Glass	≤ 6ºC; pH <2 HCl	14/40 Days
Dioxins and Furans	1613B	Solid	8oz Glass	≤ 6ºC	1 year
Dioxins and Furans	1613B	Water	1L Amber Glass	≤ 6ºC; $Na_2S_2O_3$ if Cl present	1 year
Dioxins and Furans	1613B	Fish/ Tissue	Aluminum foil	≤ 6ºC	1 year
Dioxins and Furans	8290	Water	1L Amber Glass	≤ 6ºC; $Na_2S_2O_3$ if Cl present	30/45 Days
Dioxins and Furans	8290	Solid	8oz Glass	≤ 6ºC	30/45 Days
Dioxins and Furans	8290	Fish/ Tissue	Not specified	< -10ºC	30/45 Days
Dioxins and Furans	TO-9	Air	PUF	None	7/40 Days
Diquat/Paraquat	549.2	Water	Amber Plastic	≤ 6ºC; $Na_2S_2O_3$	7/21 Days
EDB/DBCP (8011) EDB/DBCP/1,2,3-TCP (504.1)	504.1/8011	Water	40mL vials	≤ 6ºC; $Na_2S_2O_3$ if Cl present	14 Days
Endothall	548.1	Water	Amber Glass	≤ 6ºC; $Na_2S_2O_3$	7/14 Days
Enterococci	EPA 1600	Water	100mL Plastic	≤ 10ºC	8 Hours
Enterococci	Enterolert	Water	100mL Plastic	≤ 10ºC; $Na_2S_2O_3$	8 Hours
Explosives	8330/8332	Water	1L Amber Glass	≤ 6ºC	7/40 Days
Explosives	8330/8332	Solid	8oz Glass Jar	≤ 6ºC	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Water	1L Amber Glass	pH < 2 HCl; ≤ 6ºC	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	NJ EPH	Solid	4oz Glass Jar	≤ 6ºC	14/40 Days
Extractable Petroleum Hydrocarbons (aliphatic and aromatic)	MA-EPH	Water	1L Amber Glass	pH<2 HCl; ≤ 6ºC	14/40 Days
Extractable Petroleum	MA-EPH	Solid	4oz Glass Jar	≤ 6ºC	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Hydrocarbons (aliphatic and aromatic)					
Fecal Streptococci	SM9230B	Water	100mL Plastic	$\leq 10^oC$; $Na_2S_2O_3$	8 Hours
Ferrous Iron	SN3500Fe-D; Hach 8146	Water	Glass	None	Immediate
Flashpoint/ Ignitability	1010	Liquid	Plastic/Glass	None	28 Days
Florida PRO	FL PRO DEP (11/1/95)	Liquid	Glass, PTFE lined cap	$\leq 6^oC$; pH <2 H_2SO_4 or HCl	7/40 Days
Fluoride	SM4500Fl-C,D	Water	Plastic	None	28 Days
Gamma Emitting Radionuclides	901.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Gasoline Range Organics	8015	Water	40mL vials	pH<2 HCl	14 Days
Gasoline Range Organics	8015	Solid	5035 vial kit	See note 1	14 days
Gasoline Range Organics (C3-C10)	8260B modified	Water	40mL vials	$\leq 6^oC$; HCl	14 Days
Gasoline Range Organics (C3-C10)	8260B modified	Solid	4oz Glass Jar	$\leq 6^oC$	14 Days
Gasoline Range Organics- Alaska GRO	AK101	Solid	5035 vial kit	See 5035 note*	28 Days if GRO only (14 Days with BTEX)
Gasoline Range Organics- Alaska GRO	AK101	Water	40mL vials	pH<2 HCl; $\leq 6^oC$	14 Days
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Water	40mL vials	pH<2 HCl; $\leq 6^oC$	7 Days unpreserved; 14 Days preserved
Gasoline Range Organics- NwTPH-Gx	Nw-TPH-Gx	Solid	40mL vials	$\leq 6^oC$; packed jars with no headspace	14 Days
Gasoline Range Organics- Wisconsin GRO	WI MOD GRO	Water	40mL vials	pH<2 HCl; $\leq 6^oC$	14 Days
Gasoline Range Organics- Wisconsin GRO	WI MOD GRO	Solid	40mL MeOH vials	$\leq 6^oC$ in MeOH	21 Days
Glyphosate	547	Water	Glass	$\leq 6^oC$; $Na_2S_2O_3$	14 Days (18 Months frozen)
Grain Size	ASTM D422	Solid	Not specified	Ambient	N/A

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Gross Alpha (NJ 48Hr Method)	NJAC 7:18-6	Water	Plastic/Glass	pH<2 HNO_3	48 Hrs
Gross Alpha and Gross Beta	9310/900.0	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Gross Alpha and Gross Beta	9310	Solid	Glass	None	180 Days
Haloacetic Acids	552.1/552.2	Water	40mL Amber vials	NH_4Cl; $\leq$ 6ºC	14/7 Days if extracts stored $\leq$ 6ºC or 14/14 Days if extracts stored at $\leq$ -10ºC
Hardness, Total ($CaCO_3$)	SM2340B,C/130.1	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Heterotrophic Plate Count (SPC/HPC)	SM9215B	Water	100mL Plastic	$\leq$ 10ºC; $Na_2S_2O_3$	8 Hours
Heterotrophic Plate Count (SPC/HPC)	SimPlate	Water	100mL Plastic	$\leq$ 10ºC; $Na_2S_2O_3$	8 Hours
Herbicides, Chlorinated	8151	Solid	8oz Glass Jar	$\leq$ 6ºC	14/40 Days
Herbicides, Chlorinated	8151	Water	1L Amber Glass	$\leq$ 6ºC; $Na_2S_2O_3$ if Cl present	7/40 Days
Herbicides, Chlorinated	515.1/515.3	Water	1L Amber Glass	$\leq$ 6ºC; $Na_2S_2O_3$ if Cl present	14/28 Days
Hexavalent Chromium	7196/218.6/ SM3500Cr-B, C, D	Water	Plastic/Glass	$\leq$ 6ºC	24 Hours (see note 4)
Hexavalent Chromium	218.6/SM3500Cr-B, C, D	Water	Plastic/Glass	Ammonium Buffer pH 9.3-9.7	28 Days (see note 4)
Hexavalent Chromium	218.6/218.7	Drinking Water	Plastic/Glass	Ammonium Buffer pH >8	14 Days (see note 4)
Hexavalent Chromium	7196 (with 3060A)	Solid		$\leq$ 6ºC	30 Days from collection to extraction and 7 days from extraction to analysis
Hydrocarbons in Vapor	AM4.02	Vapor	20cc vapor vial with flat septum	None	N/A
Hydrogen by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Hydrogen Halide and Halogen	EPA 26	Air	Solutions	None	6 Months

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Emissions					
Ignitability of Solids	1030	Non-liquid Waste	Plastic/Glass	None	28 Days
Lead Emissions	EPA 12	Air	Filter/Solutions	None	6 Months
Light Hydrocarbons by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Light Hydrocarbons in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days
Lipids	Pace Lipids	Tissue	Plastic/Glass	$\leq$ -10°C	1 Year if frozen
Mercury, Low-Level	1631E	Solid	Glass	None	28 Days
Mercury, Low-Level	1631E	Water	Fluoropolymer bottles (Glass if Hg is only analyte being tested)	12N HCl or BrCl	48 Hours for preservation or analysis; 28 Days to preservation if sample oxidized in bottle; 90 Days for analysis if preserved
Mercury, Low-Level	1631E	Tissue	Plastic/Glass	$\leq$ - 10°C	28 Days if frozen
Mercury	7471	Solid	8oz Glass Jar	$\leq$ 6°C	28 Days
Mercury	7470/245.1/245.2	Water	Plastic/Glass	pH<2 HNO_3	28 Days
Mercury	7471/245.6	Tissue	Plastic/Glass	$\leq$ - 10°C	28 Days if frozen
Metals (GFAA)	7000/200.9	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP)	NIOSH 7300A/7303	Air	Filters	None	180 Days
Metals (ICP/ICPMS)	6010/6020	Solid	8oz Glass Jar	None	180 Days
Metals (ICP/ICPMS)	6010/6020/200.7/200.8	Water	Plastic/Glass	pH<2 HNO_3	180 Days
Metals (ICP/ICPMS)	6020	Tissue	Plastic/Glass	$\leq$ -10°C	180 Days if frozen
Methane, Ethane, Ethene	8015 modified	Water	40mL vials	HCl	14 Days
Methane, Ethane, Ethene	RSK-175; PM01/AM20GAx	Water	20mL vials	HCl; or trisodium phosphate or	14 Days; 7 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
				benzalkonium chloride and ≤ 6ºC	unpreserved
Methane, Ethane, Ethene	EPA 3C	Air	Summa Canister	None	28 Days
Methane, Ethane, Ethene	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
Methanol, Ethanol	8015 modified	Water	40mL vials	≤ 6ºC	14 Days
Methanol, Ethanol	8015 modified	Solid	2oz Glass	≤ 6ºC	14 Days
Methyl Mercury	1630	Water	Teflon/ fluoropolymer	Fresh water- 4mL/L HCl; Saline water- 2mL/L H_2SO_4 (must be preserved within 48 hours of collection)	6 months
Methyl Mercury	1630	Tissue	2-4oz glass jar	≤ 0ºC	28 Days; ethylated distillate 48 hours
Nitrogen, Ammonia	SM4500NH3/350.1	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6ºC	28 Days
Nitrogen, Total Kjeldahl (TKN)	351.2	Solid	Plastic/Glass	≤ 6ºC	28 Days
Nitrogen, Total Kjeldahl (TKN)	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6ºC	28 Days
Nitrogen, Nitrate	SM4500-NO3/352.1	Water	Plastic/Glass	≤ 6ºC	24 Hours preferred
Nitrogen, Nitrate & Nitrite combination	353.2	Solid	Plastic/Glass	≤ 6ºC	28 Days
Nitrogen, Nitrate & Nitrite combination	SM4500-NO3/353.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6ºC	28 Days
Nitrogen, Nitrite or Nitrate separately	SM4500-NO2/353.2	Water	Plastic/Glass	≤ 6ºC	48 Hours
Nitrogen, Organic	SM4500-Norg/351.2	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6ºC	28 Days
Non-Methane Organics	EPA 25C	Air	Summa Canister	None	28 Days
Non-Methane Organics	EPA 25C	Air	Tedlar Bag or equivalent	None	72 Hours
Odor	SM2150B	Water	Glass	≤ 6ºC	24 Hours
Oil and Grease/HEM	1664A/SM5520B/9070	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6ºC	28 Days
Oil and Grease/HEM	9071	Solid	Glass	≤ 6ºC	28 Days
Oil Range Organics	8015	Solid	Glass	≤ 6ºC	14/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Oil Range Organics	8015	Water	Glass	≤ 6ºC	7/40 Days
Organic Matter	ASA 29-3.5.2	Solid	Plastic/Glass	None; samples air-dried and processed prior to analysis	N/A
Oxygen, Dissolved (Probe)	SM4500-O	Water	Glass	None	15 minutes
Oxygenates on Product (GCMS SIM)	1625 modified	Product	10mL glass vial	≤ 6ºC	14 Days (7 Days from extraction)
PBDEs	1614	Water	1L Amber Glass	≤ 6ºC	1 Year/1 Year
PBDEs	1614	Solid	Wide Mouth Jar	≤ 6ºC	1 Year/1 Year
PBDEs	1614	Tissue	Aluminum Foil	≤ -10ºC	1 Year/1 Year
PCBs and Pesticides, Organochlorine (OC)	TO-4/TO-10	Air	PUF	None	7/40 Days
PCBs and Pesticides, Organochlorine (OC)	608	Water	1L Amber Glass	≤ 6ºC; $Na_2S_2O_3$ if Cl present	Pest: 7/40 Days; PCB: 1 Year/1 Year
PCBs, Pesticides (OC), Herbicides	508.1	Water	Glass	Na2SO3; pH<2 HCl; ≤ 6ºC	14/30 Days
PCBs, total as Decachlorobiphenyl	508A	Water	1L Glass, TFE lined cap	≤ 6ºC	14/30 Days
Perchlorate	331	Water	Plastic/Glass	≥0-6ºC, field filtered with headspace	28 Days
Permanent Gases (O2, N2, CO2)	RSK-175; PM01/AM20GAx	Water	40mL vials	benzalkonium chloride and ≤ 6ºC	14 Days
Permanent Gases by Bubble Strip	SM9/AM20GAx	Water	20cc vapor vial with stopper septum	None	14 Days
Permanent Gases in Vapor	AM20GAx	Vapor	20cc vapor vial with flat septum	None	14 Days
Pesticides, Organochlorine (OC)	8081	Water	1L Amber Glass	≤ 6ºC; $Na_2S_2O_3$ if Cl present	7/40 Days
Pesticides,	8081	Solid	8oz Glass Jar	≤ 6ºC	14/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Organochlorine (OC)					
Pesticides, Organochlorine (OC)	8081	Tissue	8oz Glass Jar	≤ -10ºC	1 Year if frozen/40 Days
Pesticides, Organophosphorous (OP)	8141	Solid	8oz Glass Jar	≤ 6ºC	14/40 Days
Pesticides, Organophosphorous (OP)	8141	Water	1L Amber Glass	pH 5-8 with NaOH or H_2SO_4; ≤ 6ºC; $Na_2S_2O_3$ if Cl present	7/40 Days
PCBs (Aroclors)	8082	Water	1L Amber Glass	≤ 6ºC; $Na_2S_2O_3$ if Cl present	1 Year/1 Year
PCBs (Aroclors)	8082	Solid	8oz Glass Jar	≤ 6ºC	1 Year/1 Year
PCBs (Aroclors)	8082	Tissue	Plastic/Glass	≤ -10ºC	1 Year if frozen/1 Year
PCB Congeners	1668A	Water	1L Amber Glass	≤ 6ºC but above freezing	1 Year/1 Year
PCB Congeners	1668A	Solid	4-8oz Glass Jar	≤ 6ºC but above freezing	1 Year/1 Year
PCB Congeners	1668A	Tissue	4-8oz Glass Jar	≤ -10ºC	1 Year/1 Year
Paint Filter Liquid Test	9095	Water	Plastic/Glass	None	N/A
Particle Size	ASA 15-5 modified	Solid	Plastic/Glass (100g sample)	None	N/A
Particulates	PM-10	Air	Filters	None	180 Days
Permanent Gases	EPA 3C	Air	Summa Canister	None	28 Days
Permanent Gases	EPA 3C	Air	Tedlar Bag or equivalent	None	5 Days
pH	SM4500H+B/9040	Water	Plastic/Glass	None	15 minutes
pH	9045	Solid	Plastic/Glass	None	7 Days
Phenol, Total	420.1/420.4/9065/9066	Water	Glass	pH<2 H_2SO_4; ≤ 6ºC	28 Days
Phosphorus, Orthophosphate	SM4500P/365.1/365.3	Water	Plastic	≤ 6ºC	Filter within 15 minutes, Analyze within 48 Hours
Phosphorus, Total	SM4500P/ 365.1/365.3/365.4	Water	Plastic/Glass	pH<2 H_2SO_4; ≤ 6ºC	28 Days
Phosphorus, Total	365.4	Solid	Plastic/Glass	≤ 6ºC	28 Days
Polynuclear	TO-13	Air	PUF	None	7/40 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Aromatic Hydrocarbons (PAH)					
Polynuclear Aromatic Hydrocarbons (PAH)	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6ºC but above freezing	28 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Solid	8oz Glass Jar	≤ 6ºC	14/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Water	1L Amber Glass	≤ 6ºC; $Na_2S_2O_3$ if Cl present	7/40 Days
Polynuclear Aromatic Hydrocarbons (PAH)	8270 SIM	Tissue	Plastic/Glass	≤ -10ºC	1 Year if frozen/40 Days
Purgeable Organic Halides (POX)	9021	Water	Glass; no headspace	≤ 6ºC	14 Days
Radioactive Strontium	905.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-226	903.0/903.1	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320/904.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Radium-228 (see note 3)	9320	Solid	Plastic/Glass		
Residual Range Organics- Alaska RRO	AK103	Solid	8oz Glass	≤ 6ºC	14/40 Days
Saturated Hydrocarbons		Water	≤ 6ºC; pH<2 1:1 HCl (optional)	14/40 Days preserved; 7/40 Days unpreserved	≤ 6ºC; pH<2 1:1 HCl (optional)
Saturated Hydrocarbons		Solid	≤ 10ºC	1 Year/40 Days	≤ 10ºC
Silica, Dissolved	SM4500Si-D	Water	Plastic	≤ 6ºC	28 Days
Solids, Settleable	SM2540F	Water	Glass	≤ 6ºC	48 Hours
Solids, Total	SM2540B	Water	Plastic/Glass	≤ 6ºC	7 Days
Solids, Total	SM2540G	Solid	Plastic/Glass	≤ 6ºC	7 Days
Solids, Total (FOC, OM, Ash)	ASTM D2974	Solid	Plastic/Glass	≤ 6ºC	14 Days
Solids, Total	SM2540C	Water	Plastic/Glass	≤ 6ºC	7 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Dissolved					
Solids, Total Suspended	SM2540D/USGS I-3765-85	Water	Plastic/Glass	≤ 6ºC	7 Days
Solids, Total Volatile	160.4/SM2540E	Water	Plastic/Glass	≤ 6ºC	7 Days
Solids, Total Volatile	160.4	Solid	Plastic/Glass	≤ 6ºC	7 Days
Specific Conductance	SM2510B/9050/120.1	Water	Plastic/Glass	≤ 6ºC	28 Days
Stationary Source Dioxins and Furans	EPA 23	Air	XAD Trap	None	30/45 Days
Stationary Source Mercury	EPA 101	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source Metals	EPA 29	Air	Filters	None	180 Days, 28 Days for Hg
Stationary Source PM10	EPA 201A	Air	Filters	None	180 Days
Stationary Source Particulates	EPA 5	Air	Filter/Solutions	None	180 Days
Sulfate	SM4500SO4/9036/9038/375.2/ASTM D516	Water	Plastic/Glass	≤ 6ºC	28 Days
Sulfide, Reactive	SW-846 Chap.7	Water	Plastic/Glass	None	28 Days
Sulfide, Reactive	SW-846 Chap.7	Solid	Plastic/Glass	None	28 Days
Sulfide, Total	SM4500S/9030	Water	Plastic/Glass	pH>9 NaOH; ZnOAc; ≤ 6ºC	7 Days
Sulfite	SM4500SO3	Water	Plastic/Glass	None	15 minutes
Surfactants (MBAS)	SM5540C	Water	Plastic/Glass	≤ 6ºC	48 Hours
Total Alpha Radium (see note 3)	9315/903.0	Water	Plastic/Glass	pH<2 HNO_3	180 days
Total Alpha Radium (see note 3)	9315	Solid	Plastic/Glass	None	180 days
Total Inorganic Carbon (TIC)	PM01/AM20GAx	Water	40mL VOA vial with mylar septum	≤ 6ºC	14 Days
Total Organic Carbon (TOC)	SM5310B,C,D/9060	Water	Glass	pH<2 H_2SO_4 or HCl; ≤ 6ºC	28 Days
Total Organic Carbon (TOC)	9060/Walkley Black/Lloyd Kahn	Solid	Glass	≤ 6ºC	14 Days
Total Organic Halogen (TOX)	SM5320/9020	Water	Glass; no headspace	≤ 6ºC	14 Days
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Water	40mL vials	pH<2 HCl, no headspace, ≤ 6ºC	7 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Total Petroleum Hydrocarbons (aliphatic and aromatic)	TPHCWG	Solid	Glass	≤ 6ºC	14 days
Tritium	906.0	Water	Glass	None	180 days
Turbidity	SM2130B/180.1	Water	Plastic/Glass	≤ 6ºC	48 Hours
Total Uranium	908.0/ASTM D5174-97	Water	Plastic/Glass	pH<2 HNO_3	180 days
UCMR Metals	200.8	Water	Plastic or glass	pH<2 HNO_3	28 Days
UCMR Hexavalent Chromium	218.7	Water	HDPE or propylene	Na_2CO_3/$NaHCO_3$/ $(NH_4)_2SO_4$; pH>8	14 Days
UCMR Chlorate	300.1	Water	Plastic or glass	EDA	28 Days
UCMR Perfluorinated Compounds	537	Water	Polypropylene	Trizma	14 Days
UCMR 1, 4 Dioxane	522	Water	Glass	Na_2SO_3, $NaHSO_4$; pH<4	28 Days
UV254	SM5910B	Water	Glass	≤ 6ºC	48 Hours
Vermiculite	EPA 600/R-93/116	Solid	Plastic/Glass	None (handling must be done in HEPA filtered fume hood; drying may be required)	N/A
Volatile Fatty Acids	AM21G	Water	40mL clear VOA vials	≤ 6ºC	21 Days
Volatile Fatty Acids (low level)	AM23G	Water	40mL clear VOA vials	≤ 6ºC with benzalkonium chloride	14 Days
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Water	40mL vials	pH<2 HCl; ≤ 6ºC	14 Days preserved
Volatile Petroleum Hydrocarbons (aliphatic and aromatic)	MA-VPH	Solid	4-8oz Glass Jar	≤ 6ºC; packed jars with no headspace	7/28 Days
Volatiles	TO-14	Air	Summa Canister	None	28 Days
Volatiles	TO-14	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	TO-15	Air	Summa Canister or Tedlar Bag	None	28 Days

Parameter	Method	Matrix	Container	Preservative	Max Hold Time
Volatiles	TO-17	Air	Thermal desorption tubes via SKC Pocket Pumps or equivalent	≤ 6ºC but above freezing	28 Days
Volatiles	TO-18/8260	Air	Tedlar Bag or equivalent	None	72 Hours
Volatiles	8260	Solid	5035 vial kit	See note 1 (analyze for acrolein and acrylonitrile per local requirements)	14 days
Volatiles	8260	Water	40mL vials	pH<2 HCl; ≤ 6ºC; $Na_2S_2O_3$ if Cl present (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days
Volatiles	8260	Conc. Waste	5035 vial kit or 40mL vials	≤ 6ºC	14 Days
Volatiles	624	Water	40mL vials	pH<2 HCl; ≤ 6ºC; $Na_2S_2O_3$ if Cl present (or unpreserved if run within 7 days of collection) (preserve and analyze for acrolein and acrylonitrile per local requirements)	14 Days (7 Days for aromatics if unpreserved)
Volatiles (see note 2)	524.2	Water	40mL vials (in duplicate)	pH<2 HCl; ≤ 6ºC; Ascorbic acid or $Na_2S_2O_3$ if Cl present[2]	14 Days
Whole Oil	ASTM D3328 (prep); ASTM D5739	Product	10mL glass vials	≤ 6ºC	N/A

[1] **5035/5035A Note**: 5035 vial kit typically contains 2 vials water, preserved by freezing **or**, 2 vials aqueous sodium bisulfate preserved at 4ºC, **and** one vial methanol preserved at ≤6ºC **and** one container of unpreserved sample stored at ≤6ºC.

[2] Method 524.2 lists ascorbic acid as the preservative when residual chlorine is suspected, unless gases or Table 7 compounds are NOT compounds of interest and then sodium thiosulfate is the preservative recommended.

[3] Methods 9315 and 9320 both state that if samples are unpreserved, the samples should be brought to the lab within 5 days of collection, preserved in the lab, and then allowed to sit for a minimum of 16 hours before sample preparation/analysis.

[4] The holding time for hexavalent chromium may be extended by the addition of the ammonium buffer listed in EPA 218.6 per the 2012 EPA Method Update Rule. Although Method 218.6 stipulates a different pH range (9.0 to 9.5) for buffering, this method requirement was modified in the Method Update Rule to a pH range of 9.3 to 9.7.For non-potable waters, adjust the pH of the sample to 9.3 to 9.7 during collection with the method required ammonium sulfate buffer to extend the holding time to 28 days. For potable waters, addition of the buffer during collection will extend the holding time for 14 days per EPA 218.7 and the EPA UCMR program.

Supplier: **Pace Analytical Services, Inc.**

ADDITIONAL PRICING

PLEASE INDICATE THE STANDARD TURNAROUND TIME UNDER NORMAL CONDITIONS, IN CALENDAR DAYS TO THE CITY OF LEWISVILLE.

7-10 Business Days

ANY ANALYSIS WHICH VARIES FROM THE ABOVE STATED TURNAROUND TIME MUST BE INDICATED AND TIME NOTED BELOW:

Gross Alpha/Beta - 3 weeks
Subcontract Analysis outside of Pace - 2 weeks

PLEASE INDICATE THOSE ANALYTES TO BE SUB-CONTRACTED AND SUB-CONTRACT LABORATORY:

Geosmin/MIB - Ana-Lab
Organophosphorus Pesticides 1657 - Ana-Lab
Cryptospordium - ASI

PLEASE INDICATE DISCOUNT FROM PUBLISHED FEES FOR ANALYSIS NOT LISTED IN THIS BID.

20%

QUOTE ADDITIONAL COST FOR SAMPLE PICK-UP.

$27.00

PLEASE INDICATE ALL CHARGES FOR EXPERT TESTIMONY THAT MAY BE REQUIRED DURING LITIGATION.

$75 per person

PLEASE INDICATE COST, IF ANY, FOR RE-ANALYSIS OF ANY QUESTIONABLE TEST RESULTS. (% COST OF ORIGINAL ANALYSIS)

Full cost/bid amount unless results do not match within reason of original result. If results do not match within reason of original result the cost will be $0.

PLEASE INDICATE TURNAROUND TIME AND % COST INCREASE FOR 100% RUSH OF STANDARD TURNAROUND TIME.

DAYS: 1-2 Days
2 X the cost

PLEASE INDICATE TURNAROUND TIME AND % COST INCREASE FOR 50% RUSH OF STANDARD TURNAROUND TIME.

DAYS: 3-4 Days
1.5 X the cost

PLEASE QUOTE PERCENT DISCOUNT OFF INDIVIDUAL PARAMETERS LISTED IN TABLE IV AND TABLE V [40 CFR PART 122 APPENDIX D]

20%

Supplier: **Pace Analytical Services, Inc.**

CITY OF LEWISVILLE
PURCHASING DIVISION
ANNUAL CONTRACT STANDARD PROVISIONS

Contractor and the City of Lewisville agree as follows:

1. **TERM:** The term of this annual contract is twelve-months, with the option to extend for up to two (2) additional twelve-month periods, subject to the approval of the Contractor and the City Manager, or his designee.

2. **DESCRIPTION – SALE OF GOODS AND SERVICES:** Contractor will transfer and deliver to the City, and the City will pay for and accept the City's requirements during this agreement. It is understood that quantities shown on the Bid Sheets are estimates and do not obligate the City to order or accept more than the City's actual requirements during the Agreement, nor do the estimates limit the City to ordering less than it's actual needs during the Agreement, subject to availability of appropriate funds.

3. **PURCHASE ORDER:** The City will exercise its right to specify time, place, and quantity to be delivered through the use of a purchase order.

4. **PRICE ADJUSTMENT:** All goods and services to be delivered pursuant to this Agreement, including any extensions thereof, will be purchased at the prices stated on the Contractor's Bid Sheet; provided that, at renewal or extension of the Agreement for an additional twelve-months, the prices for goods and services to be delivered during the ensuing twelve-month period may be increased or decreased to the extent of changes in the cost of material to Contractor, as reflected in written documentation provided by the Contractor to the City. The written documentation must allow the City the ability to verify all requested price adjustments.

Supplier: **Pace Analytical Services, Inc.**

CITY OF LEWISVILLE PURCHASING DIVISION
ADDITIONAL TERMS

ANTI-LOBBYING PROVISION

During the period between proposal / sealed bid submission date and the contract award, proposers, including their agents and representatives, shall not directly discuss or promote their proposal with any member of the City of Lewisville City Council or City staff except in the course of City-Sponsored inquiries, briefings, interviews, or presentations, unless requested by the City.

This provision is not meant to preclude offerors from discussing other matters with City Council members or City staff. This policy is intended to create a level playing field for all potential offerors, assure that contract decisions are made in public, and to protect the integrity of the RFP / Bid Evaluation process. Violation of this provision may result in rejection of the offeror's proposal.

LAWS AND ORDINANCES

Laws and Ordinances: The Contractor shall at all times observe and comply with all Federal, State and local laws, ordinances and regulations which in any manner affect the Contract or the work, and shall indemnify and save harmless the City against any claim arising from the violation of any such laws, ordinances and regulations whether by the Contractor or his employees.

PROTECTION OF RESIDENT WORKERS

Protection of Resident Workers: The City of Lewisville actively supports the Immigration and Nationality Act (INA) which includes provisions addressing employment eligibility, employment verification, and nondiscrimination. Under the INA, employers may hire only persons who may legally work in the United States (i.e., citizens and nationals of the U.S.) and aliens authorized to work in the U.S. The employer must verify the identity and employment eligibility of anyone to be hired, which includes completing the Employment Eligibility Verification Form (I-9). The Contractor and its Subcontractors shall establish appropriate procedures and controls so no services or products under the Contract Documents will be performed or manufactured by any worker who is not legally eligible to perform such services or employment. The City reserves the right to audit Contractor's or Subcontractor's employment records to verify the existence of a completed Employment Eligibility Verification Form (I-9) for every worker performing services or manufacturing products under the Contract Documents. The audit will be at the City's expense.

IMMIGRATION REFORM AND CONTROL ACT

Immigration Reform and Control Act (8 U.S.C. §1324a): The City of Lewisville supports the Immigration Reform and Control Act (IRCA) which is a comprehensive scheme prohibiting the employment of unauthorized aliens in the United States. The Contractor shall submit a declaration signed under penalty of perjury of the laws of the State of Texas stating that it has not been found in violation of IRCA by the

United States Attorney General or Secretary of Homeland Security in the preceding five (5) years. The Contractor shall ensure that its Subcontractors submit a declaration signed under penalty of perjury of the laws of the State of Texas stating that they have not been found in violation of IRCA by the United States Attorney General or Secretary of Homeland Security in the preceding five (5) years. The Contractor and its Subcontractors shall at all times during the term of the contract with the City comply with the requirements of IRCA and shall notify the City within fifteen (15) working days of receiving notice of a violation of IRCA. The City may terminate a contract with the Contractor if the City determines that (a) the Contractor or its Subcontractors have been untruthful regarding IRCA violations in the preceding five (5) years; (b) if the Contractor fails to ensure that its Subcontractors submit the aforementioned declaration; or (c) the Contractor or its Subcontractors fail to timely notify the City of an IRCA violation.

Pace Analytical Services LLC

Contractor Name

Greg Horton **01/13/2020**

Authorized Signature Date

Supplier: **Pace Analytical Services, Inc.**

CITY OF LEWISVILLE

COOPERATIVE PURCHASING AGREEMENT

Several Governmental entities around the City of Lewisville have indicated an interest in being included in this contract. Should these Governmental Entities decide to participate in this contract, would you, (the vendor) agree that all terms conditions, specifications, and pricing would apply?

☑ YES ☐ NO

(a) If you (the Vendor) checked yes, the following will apply.

(b) Governmental Entities utilizing Internal-Governmental contracts with the City of Lewisville will be eligible, but not obligated, to purchase materials/services under the contract(s) awarded as a result of this solicitation. All purchases by Governmental Entities other than the City of Lewisville will be billed directly to that Governmental Entity and paid by that Governmental Entity. City of Lewisville will not be responsible for another Governmental Entity's debts. Each Governmental Entity will order their own material/service as needed.

BID INVITATION NO:	**20-12-A**
COMMODITY:	**Chemical Analysis**

FIRM NAME: **Pace Analytical Services LLC**

SIGNATURE OF PERSON AUTHORIZED TO SIGN BID:

Greg Horton

DATE: **01/13/2020**

SIGNER'S NAME AND TITLE:

Greg Horton, Senior Account Executive

Supplier: **Pace Analytical Services, Inc.**

STATE RECIPROCAL REQUIREMENT

The City of Lewisville, as a governmental agency of the State of Texas, may not award a contract for general construction, improvements, services or public works projects or purchases of supplies, materials, or equipment to a non-resident bidder unless the non-resident's bid is lower than the lowest bid submitted by a responsible Texas resident bidder by the same amount that a Texas resident bidder would be required to underbid a non-resident bidder to obtain a comparable contract in the state in which the non-resident's principal place of business is located (Section 2252.002 of the Government Code). Bidder shall answer all the following questions by encircling the appropriate response or completing the blank provided.

1. Where is your principal place of business? **Texas**

2. Only if your principal place of business is not in the state of Texas, please indicate:

   A. In which state is your principal place of business located? **Texas**

   B. Does that state favor resident bidders (bidders in your state) by some dollar increment or percentage? ☐ YES ☑ NO

   C. If "YES", what is that dollar increment or percentage? **0**

NON-COLLUSION STATEMENT

The undersigned affirms that they are duly authorized to execute this contract, that this company, corporation, firms, partnership or individual has not prepared this bid in collusion with any other Bidder, and that the contents of this bid as to prices, terms or conditions of said bid have not been communicated by the undersigned nor by any employer or agent to any other person engaged in this type of business prior to the official opening of this bid.

Vendor:	**Pace Analytical Services, LLC**
Address:	**400 W. Bethany Road, Suite 190**
City, State, Zip:	**Allen, Texas 75013**
Phone	**972-727-1123**
Email Address:	**greg.horton@pacelabs.com**
Bidder (Print name)	**Greg Horton**
Bidder Signature	**Greg Horton**
Position with Company	**Senior Account Executive**
Signature of company official authorizing this bid:	**Tim Gramling**
Company Official (Print name):	**Tim Gramling**
Position with company:	**Assistant General Manager**

Supplier: **Pace Analytical Services, Inc.**

CITY OF LEWISVILLE
PURCHASING DIVISION

Exceptions

Bid 20-21-A

On the lines below, please list any exceptions taken to this bid invitation.

Item#	Description
None	**None**

Signature **Greg Horton**
Company **Pace Analytical Services LLC**
Date **01/13/2020**

No Exceptions taken to this bid invitation.

Signature **Greg Horton**
Company **Pace Analytical Services, LLC**
Date **01/13/2020**