APPENDIX G

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION

(Electronic)

DATA VERIFICATION SUMMARY REPORT

FOR

WATER AND SEDIMENT SAMPLES

collected from

CLEAR CREEK

HOUSTON, TEXAS

Data Verifier: Sandra de las Fuentes (Parsons – Austin, Texas)

INTRODUCTION

The following data verification summary report covers environmental water sediment samples collected from Clear Creek in Houston, Texas on July 26, 2005 through July 29, 2005, August 02, 2005, August 03, 2005 and August 23, 2005. The samples were received by North Water District Laboratory Services, Inc (NWDLS) in The Woodlands, Texas on July 29, 2005, August 02, 2005, August 04, 2005 and August 24, 2005 and analyzed for conventional parameters including Total Suspended Solids (TSS) and Total Organic Carbon (TOC) for waters and Percent Solids and Percent Volatile Solids for sediments. Analysis results for thirty (30) water samples and thirty-six (36) sediment samples, including four duplicate samples for waters and sediments, were reported in the following laboratory Sample Delivery Groups (SDG):

8085001, 8085002, 8085003 and 8295008

Sample identification numbers and sample collection dates are summarized on Table 1. Recommended data qualifiers are summarized on Table 2.

All samples were collected by the University of Houston and Parsons following the procedures described in the QAPP. All analyses were performed by NWDLS in The Woodlands, Texas following procedures outlined in the QAPP.

EVALUATION CRITERIA

The data submitted by the laboratory has been reviewed and verified following the guidelines outlined in the QAPP and USEPA NFG for Inorganic Data Review (July 2002). Information reviewed in the data packages includes sample results; the laboratory quality control results; blanks; sample checklist and chain-of-custody forms. The verification protocol addressed the following parameters: method blanks, laboratory control spike recoveries and field duplicate sample results. The analyses and findings presented in this report are based on the reviewed information, and meeting guidelines in the QAPP (with the exceptions noted below).

WATER ANALYSES; TSS AND TOC

General

The SDGs included in this report, consisted of thirty (30) water samples, including four duplicate samples analyzed for TSS and TOC using USEPA Methods 160.2 and 415.1, respectively. Samples for the SDGs were collected and analyzed following the procedures and protocols outlined in the QAPP, with the exception of the following.

The samples in SDGs 8085001 and 8085002 were inadvertently stored in a freezer instead of a refrigerator while being kept prior to delivery to NWDLS. Due to the nature of the TSS and TOC methods, it is my belief that sample integrity was not considered compromised with the freezing and thawing of the samples. Three samples' containers were broken during the thawing process and the samples were lost. NDWLS was not able to analyze the following samples for TOC: 11451, 17069 Dup and 11448. The remaining samples were analyzed and reported as usual.

All samples collected were prepared and analyzed within the holding times required by the method.

Accuracy

Accuracy was evaluated using the %R results for the laboratory control sample (LCS) for TOC. Due to the nature of the TSS method, spiking laboratory pure water was not possible and was therefore was not evaluated.

- The LCS results met criteria (laboratory control limits) of 80-100%. One LCS sample was analyzed with each of the four SDGs.

Precision

Analytical precision was evaluated for both TOC and TSS using the Relative Percent Difference (RPD) values obtained from field duplicate samples. Overall precision of the sampling and analysis process was evaluated using the parent sample/field duplicate sample result RPD values. Evaluation results for the field duplicate samples are as follows:

- The following field samples were analyzed as field duplicate samples as part of the four SDGs:

  SDG: 8085001; 17069 and 17069 Dup
  SDG: 8085002; TBD-3 and TBD-3 Dup
  SDG: 8085003; TBD-1 and TBD-1 Dup
  SDG: 8295008; 17071 and 17071 Dup

Field duplicate sample analysis results for TSS were within acceptance criteria as per the Data Quality Objectives (DQO) as specified in the Quality Assurance Project Plan (QAPP).

Field duplicate sample analysis results for TOC were within acceptance criteria, except for sample 17069 (SDG 8085001), as per the Data Quality Objectives (DQO) as specified in the Quality Assurance Project Plan (QAPP). Sample 17069 Dup was lost during the sample freezing and thawing process and therefore was not evaluated for precision.

Note: NWDLS randomly selected sample 11450 and analyzed it in duplicate to meet the QC requirement for the same batch (SDG 8085001) that was not able to report field duplicate results. The laboratory duplicate RPD result was within acceptance criteria and therefore sufficient to qualify the batch. No flags were applied to any of the TOC results in SDG 8085001.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the chain-of-custody procedures to those described in the QAPP;
- Evaluating holding times; and
- Examining method blanks for contamination of samples during analysis.

The samples in all SDGs were collected (with the exception of the aforementioned frozen samples) and analyzed following the QAPP, COC and analytical procedures. All samples were prepared and analyzed with the holding times required for the analysis.

- All method blank criteria were met. The method blanks associated with all four SDGs, no analytes were reported at levels above the AWRLs.

Completeness

Completeness has been evaluated by comparing the total number of water samples collected with the total number of water samples with valid analytical data for all four SDGs.

Three reported results for water samples have been rejected or invalidated (qualified "R"). The completeness for all SDGs combined is 95% compared to the minimum acceptance limit of 90%.

$$\%\text{Complete} = \frac{(\#\text{ samples} \times \#\text{ results}) - \#\text{ rejects}}{(\#\text{ samples} \times \#\text{ results})} \times 100$$

$$\%C = \frac{(30 \times 2) - 3}{(30 \times 2)} \times 100$$

$$\%C = 95$$

SEDIMENT ANALYSES; PERCENT SOLIDS AND VOLATILE SOLIDS

General

The SDGs included in this report, consisted of thirty-six (36) sediment samples, including four duplicate samples analyzed for Percent Solids and Percent Volatile Solids using Standard Method SM2540G. Samples for the SDGs were collected and analyzed following the procedures and protocols outlined in the QAPP, with the exception of the following.

The samples in SDGs 8085001 and 8085002 were inadvertently stored in a freezer instead of a refrigerator while being kept prior to delivery to NWDLS. . Due to the nature of the Percent solids and Percent volatile solids methods, it is my belief that sample integrity was not considered compromised with the freezing and thawing of the samples. No sediment samples were lost during the freezing and thawing process.

All samples collected were prepared and analyzed within the holding times required by the method.

Accuracy

Accuracy could not be evaluated for either Percent Solids or Percent Volatile Solids due to the nature of the analyses methods.

Precision

Analytical precision was evaluated for both Percent Solids and Percent Volatile Solids using the Relative Percent Difference (RPD) values obtained from field duplicate samples. Overall precision of the sampling and analysis process was evaluated using the parent sample/field duplicate sample result RPD values. Evaluation results for the field duplicate samples are as follows:

- The following field samples were analyzed as field duplicate samples as part of the four SDGs:

  SDG: 8085001; 17069 and 17069 Dup
  SDG: 8085002; TBD-3 and TBD-3 Dup
  SDG: 8085003; TBD-1 and TBD-1 Dup
  SDG: 8295008; 17071 and 17071 Dup

Field duplicate sample analysis results for Percent Solids or Percent Volatile Solids were within acceptance criteria as per the Data Quality Objectives (DQO) as specified in the Quality Assurance Project Plan (QAPP).

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the chain-of-custody procedures to those described in the QAPP;
- Evaluating holding times; and
- Examining method blanks for contamination of samples during analysis.

The samples in all SDGs were collected (with the exception of the aforementioned frozen samples) and analyzed following the QAPP, COC and analytical procedures. All samples were prepared and analyzed with the holding times required for the analysis.

- All method blank criteria were met. The method blanks associated with all four SDGs, no analytes were reported at levels above the AWRLs.

Completeness

Completeness has been evaluated by comparing the total number of sediment samples collected with the total number of sediment samples with valid analytical data for all four SDGs.

No reported results for sediment samples have been rejected or invalidated (qualified "R"). The completeness for all four SDGs combined is 100% compared to the minimum acceptance limit of 90%.

$$\%\text{Complete} = \frac{(\#\text{ samples} \times \#\text{ results}) - \#\text{ rejects}}{(\#\text{ samples} \times \#\text{ results})} \times 100$$

$$\%C = \frac{(36 \times 2)}{(36 \times 2)} \times 100$$

$$\%C = 100$$

Quality Systems Audit
North Water District Laboratory Services, Inc.
August 24, 2005

To: Mr. Steve Grychka
Laboratory Director and Quality Assurance Officer
North Water District Laboratory Services, Inc.
8725 Fawn Trail
The Woodlands, TX 77385

From: Sandra de las Fuentes
Parsons
8000 Centre Park Dr. Suite 200
Austin, TX 78754

Subject: Audit conducted at the North Water District Laboratory Services, Inc. (NWDLS) on August 24, 2005.

Purpose: The purpose of this audit was to assess laboratory operations and confirm compliance with the Quality Assurance Project Plans (QAPP) for the Texas Commission on Environmental Quality (TCEQ) and The University of Houston's Total Maximum Daily Loads for Dioxins in the Houston Ship Channel and the Total Maximum Daily Loads for Fecal Pathogens in The Clear Creek Watershed.

Scope: The audit involved laboratory areas producing data pertaining to water and sediment analysis as detailed in the individual project QAPPs. The areas that were concentrated on were sample receipt, analysis, and data reports for conventional parameters such as TSS, TOC, DOC and TDS in waters and TOC, percent solids and volatile solids in sediments.

Executive Summary: At the time of the audit, NWDLS appeared to have implemented a quality assurance program that was overall effective with regards to ensuring that all QA/QC requirements are met, documentation related to the analyses is complete and adequately maintained, and that results are reported accurately. Laboratory personnel involved in generating analytical data appeared to have adequate training and a thorough knowledge of the QAPP and all SOPs specific to the analyses or task performed and/or supervised.

No negative findings were identified. A few recommendations related to documentation are provided to assist the laboratory. The recommendations do not require a response from NWDLS.

Recommendations:

1. Training Records

The training records for the following personnel were reviewed: Mr. Steve Grychka, David Tran, Horacio Munoz, and Laszlo Kecskes.

- The "Initial Demonstration of Capability" forms (DOC) need not include the standard deviation calculation. DOCs are intended to measure an analyst's ability to accurately carry out a specific method by measuring percent recoveries of known spikes. Precision (standard deviation) is more applicable to Method Detection Limit studies, where the measurement of reproducibility is evaluated.

- I recommend including an acceptability range for percent recovery on the DOC forms, based on method control charts.

- "NWDLS Quality Assurance Sign-Off Form", "Traceability/Corrective Action Statement" and "Initial Demonstration of Capability Certificate Statement" should reference a specific document and revision number (QAM and/or SOPs) in which employees were trained. This will help identify those personnel that need to be recertified when major changes and revisions to the QAM or SOPs have been enforced.

2. Master List for SOPs

I recommend the QAO keep a "master" list of all SOP, with latest revision date and version number to more accurately be able to identify which SOPs are in need of updating (whether annual or significant change) as required. The QAM has a couple of partial lists of general and test method SOPs (pages 8, 9, 15 and 16), but it may be beneficial to have a separate master list of all SOPS (method specific/technical, administrative, data reporting, etc.) in one document so that the QAM doesn't have to be updated whenever a SOP requires updating.

Table 1. Frequency of QC Samples run by NWDLS

a. Laboratory Duplicates

Analyte	Summer 2004		
	# samples	# dups	frequency
TSS	30	4	13.3%
TOC (water)	30	4	13.3%
Total Solids	36	4	11.1%
Volatile Solids	36	4	11.1%

b. Method Blanks

Analyte	Summer 2004		
	# samples	# blanks	frequency
TSS	30	4	13.3%
TOC (water)	30	4	13.3%
Total Solids	36	4	11.1%
Volatile Solids	36	4	11.1%

c. Laboratory Control Standards

Analyte	Summer 2004		
	# samples	# spikes	frequency
TOC (water)	30	4	13.3%

Table 2a. Frequency of Field Blanks

	# loc	# blanks	%
summer 05			
-water	26	4	15%
-sediment	32	4	13%

Table 2c. Field Duplicate Agreement for NWDLS water results

Sample ID	Date	Field Duplicates (mg/L)							
		TSS				TOC			
		Parent	Duplicate	%RPD[a]	Met DOQ?[b]	Parent	Duplicate	%RPD[a]	Met DOQ?[b]
Summer 2005									
17069	7/27/2005	28.4	32.4	13.16%	Y	7.63	NA		N
TBD-3	7/29/2005	45.4	54.6	18.40%	Y	17	16.8	1.18%	Y
TBD-1	8/2/2005	26.8	25.2	6.15%	Y	6.03	6.3	4.38%	Y
17071	8/23/2005	22.8	26.2	13.88%	Y	8.28	8.41	1.56%	Y

Table 3a. Frequency of Field Duplicates

Conventional Parameters (NWDLS)			
media	**# samples**	**# dups**	**frequency**
Summer 2005			
water	26	4	15.4%
sediment	32	4	12.5%

Sample 17069-dup was not analyzed for TOC due to sample container breaking

Table 3f. Field Duplicate Agreement for NWDLS sediment results

Sample ID	Date	Field Duplicates (%)							
		Total Solids				Volatile Solids			
		Parent	Duplicate	%RPD[a]	Met DOQ?[b]	Parent	Duplicate	%RPD[a]	Met DOQ?[b]
Summer 2005									
17069	7/27/2005	32.6	34.7	6.24%	Y	14.6	14.6	0.00%	Y
TBD-3	7/29/2005	66.9	66.5	0.60%	Y	5.21	5.28	1.33%	Y
TBD-1	8/2/2005	77.3	75	3.02%	Y	1.69	1.67	1.19%	Y
17071	8/23/2005	69	69.6	0.87%	Y	4.21	4.19	0.48%	Y

[a] Percentage difference calculated as [abs(t1-t2)/average(t1,t2)]

[b] QAPP states that field duplicates meet the DQO if the RPD is less than 50%

Table 2b. Laboratory Duplicate Agreement for NWDLS Sediment results

Date Performed	Laboratory Duplicates (%)								Blanks (%)	
	Total Solids				Volatile Solids				Total Solids	VS
	Measur. 1	Measur 2	%RPD[a]	Met DOQ?[b]	Measur. 1	Measur 2	%RPD[a]	Met DOQ?[b]		
8/1/2005	63.9	60.5	5.47%	Y	7.79	7.87	1.02%	Y	< 0.1	< 0.1
8/3/2005	67.9	68.1	0.29%	Y	6.62	6.69	1.05%	Y	< 0.1	< 0.1
8/4/2005	66.6	64.1	3.83%	Y	4.03	4.18	3.65%	Y	< 0.1	< 0.1
8/24/2005	70.2	71.2	1.41%	Y	4.72	4.22	11.19%	N	< 0.1	< 0.1

[a] Percentage difference calculated as [abs(t1-t2)/average(t1,t2)]

[b] QAPP states that lab duplicates meet the DQO if the RPD is less than 10% for % solids. An RPD for % volatile solids was not specified in the QAPP but was assumed

Table 3a. Holding Time Verification for NWDLS Water results

Station ID	Date Sampled	Date Analyzed		Exceeds holding time?	
		TSS	TOC	TSS	TOC
Summer 2005					
11452	07/26/2005	8/1/2003	3/18/2004	N	N
17079	07/26/2005	8/1/2005	3/18/2004	N	N
17076	07/26/2005	8/1/2005	3/18/2004	N	N
17068	07/26/2005	8/1/2005	3/18/2004	N	N
17074	07/26/2005	8/1/2005	3/23/2004	N	N
11451	07/27/2005	8/1/2005	3/23/2004	N	N
11450	07/27/2005	8/1/2005	3/23/2004	N	N
17069	07/27/2005	8/1/2005	3/23/2004	N	N
17069-dup	07/27/2005	8/1/2005	4/1/2004	N	N
17071	07/27/2005	8/1/2005	4/1/2004	N	N
11425	07/28/2005	8/3/2005	4/1/2004	N	N
16473	07/28/2005	8/3/2005	4/1/2004	N	N
16678	07/28/2005	8/3/2005	4/1/2004	N	N
11448	07/28/2005	8/3/2005	4/14/2004	N	N
16576	07/28/2005	8/3/2005	4/14/2004	N	N
16486	07/29/2005	8/3/2005	4/14/2004	N	N
16493	07/29/2005	8/3/2005	4/14/2004	N	N
TBD-4	07/29/2005	8/3/2005	4/14/2004	N	N
TBD-3	07/29/2005	8/3/2005	4/14/2004	N	N
TBD-3-dup	07/29/2005	8/3/2005	4/14/2004	N	N
TBD-1	08/02/2005	8/5/2005	4/20/2004	N	N
TBD-1-dup	08/02/2005	8/5/2005	4/20/2004	N	N
TBD-2	08/02/2005	8/5/2005	4/20/2004	N	N
16611	08/02/2005	8/5/2005	4/20/2004	N	N
16577	08/02/2005	8/5/2005	4/29/2004	N	N
16575	08/02/2005	8/5/2005	4/29/2004	N	N
16985	08/02/2005	8/5/2005	4/29/2004	N	N
16475	08/02/2005	8/5/2005	4/29/2004	N	N
17071	08/23/2005	8/25/2005	4/29/2004	N	N
17071-dup	08/23/2005	8/25/2005	5/6/2004	N	N

Table 3b. Holding Time Verification for NWDLS Sediment results

Station ID	Date Sampled	Date Analyzed		Exceeds Holding Time?	
		Total Solids	Volatile Solids	Total Solids	Volatile Solids
Summer 2005					
11452	07/26/2005	8/1/2005	8/1/2005	N	N
17079	07/26/2005	8/1/2005	8/1/2005	N	N
17076	07/26/2005	8/1/2005	8/1/2005	N	N
17068	07/26/2005	8/1/2005	8/1/2005	N	N
17074	07/26/2005	8/1/2005	8/1/2005	N	N
11451	07/27/2005	8/1/2005	8/1/2005	N	N
11450	07/27/2005	8/1/2005	8/1/2005	N	N
17069	07/27/2005	8/1/2005	8/1/2005	N	N
17069-dup	07/27/2005	8/1/2005	8/1/2005	N	N
17071	07/27/2005	8/1/2005	8/1/2005	N	N
11425	07/28/2005	8/3/2005	8/3/2005	N	N
16473	07/28/2005	8/3/2005	8/3/2005	N	N
16678	07/28/2005	8/3/2005	8/3/2005	N	N
11448	07/28/2005	8/3/2005	8/3/2005	N	N
16576	07/28/2005	8/3/2005	8/3/2005	N	N
16486	07/29/2005	8/3/2005	8/3/2005	N	N
16493	07/29/2005	8/3/2005	8/3/2005	N	N
TBD-4	07/29/2005	8/3/2005	8/3/2005	N	N
TBD-3	07/29/2005	8/3/2005	8/3/2005	N	N
TBD-3-dup	07/29/2005	8/3/2005	8/3/2005	N	N
TBD-1	08/02/2005	8/4/2005	8/4/2005	N	N
TBD-1-dup	08/02/2005	8/4/2005	8/4/2005	N	N
TBD-2	08/02/2005	8/4/2005	8/4/2005	N	N
16611	08/02/2005	8/4/2005	8/4/2005	N	N
16577	08/02/2005	8/4/2005	8/4/2005	N	N
16575	08/02/2005	8/4/2005	8/4/2005	N	N
16985	08/02/2005	8/4/2005	8/4/2005	N	N
16475	08/02/2005	8/4/2005	8/4/2005	N	N
17071	08/23/2005	8/24/2005	8/24/2005	N	N
17071-dup	08/23/2005	8/24/2005	8/24/2005	N	N
17071-2A	08/23/2005	8/24/2005	8/24/2005	N	N
17071-2B	08/23/2005	8/24/2005	8/24/2005	N	N
17071-3A	08/23/2005	8/24/2005	8/24/2005	N	N
17071-3B	08/23/2005	8/24/2005	8/24/2005	N	N
17071-4A	08/23/2005	8/24/2005	8/24/2005	N	N
17071-4B	08/23/2005	8/24/2005	8/24/2005	N	N

Table 4a. Check of Data Completeness for NWDLS Water Data

Station ID	Date	TSS (mg/L)	TOC (mg/L)
Summer 2005			
11452	07/26/2005	58.0	5.79
17079	07/26/2005	30.8	5.59
17076	07/26/2005	25.6	5.39
17068	07/26/2005	16.0	6.28
17074	07/26/2005	96.8	5.75
11451	07/27/2005	64.0	*
11450	07/27/2005	51.2	5.82
17069	07/27/2005	28.4	7.63
17069-dup	07/27/2005	32.4	*
17071	07/27/2005	26.4	6.53
11425	07/28/2005	26.6	9.93
16473	07/28/2005	15.4	5.77
16678	07/28/2005	52.6	11.5
11448	07/28/2005	56.0	*
16576	07/28/2005	26.6	7.09
16486	07/29/2005	74.6	2.63
16493	07/29/2005	7.8	10.3
TBD-4	07/29/2005	65.8	3.15
TBD-3	07/29/2005	45.4	17.0
TBD-3-dup	07/29/2005	54.6	16.8
TBD-1	08/02/2005	26.8	6.03
TBD-1-dup	08/02/2005	25.2	6.30
TBD-2	08/02/2005	9.6	13.2
16611	08/02/2005	17.6	6.45
16577	08/02/2005	26.2	7.10
16575	08/02/2005	22.6	7.39
16985	08/02/2005	26.8	8.93
16475	08/02/2005	23.2	5.34
17071	08/23/2005	22.8	8.28
17071-dup	08/23/2005	26.2	8.41

No. locations sampled	30	30	60
No. samples rejected	0	3	3
% rejected	0%	10%	5%
% usable			**95%**

Table 4b. Check of Data Completeness for NWDLS Sediment

Station ID	Date	Total Solids (%)	Volatile Solids (%)
Spring 2004			
11452	07/26/2005	63.9	7.79
17079	07/26/2005	68.6	9.75
17076	07/26/2005	61.5	8.46
17068	07/26/2005	71.1	7.44
17074	07/26/2005	62.3	7.18
11451	07/27/2005	73	6.85
11450	07/27/2005	70.6	3.95
17069	07/27/2005	32.6	14.6
17069-dup	07/27/2005	34.7	14.6
17071	07/27/2005	78.5	3.68
11425	07/28/2005	59.6	6.2
16473	07/28/2005	71.8	3.82
16678	07/28/2005	75.9	5.17
11448	07/28/2005	62.9	4.61
16576	07/28/2005	66.9	7.24
16486	07/29/2005	67.9	6.62
16493	07/29/2005	80.6	3.55
TBD-4	07/29/2005	41.5	9.11
TBD-3	07/29/2005	66.9	5.21
TBD-3-dup	07/29/2005	66.5	5.28
TBD-1	08/02/2005	77.3	1.69
TBD-1-dup	08/02/2005	75	1.67
TBD-2	08/02/2005	76.9	1.74
16611	08/02/2005	79.3	0.88
16577	08/02/2005	73.8	3.59
16575	08/02/2005	66.6	4.03
16985	08/02/2005	77.0	2.60
16475	08/02/2005	68.1	4.68
17071	08/23/2005	69.0	4.21
17071-dup	08/23/2005	69.6	4.19
17071-2A	08/23/2005	73.2	2.80
17071-2B	08/23/2005	65.1	5.89
17071-3A	08/23/2005	70.2	4.72
17071-3B	08/23/2005	79.0	2.13
17071-4A	08/23/2005	63.8	5.38
17071-4B	08/23/2005	79.4	1.98

Table 4b. Check of Data Completeness for NWDLS Sediment

Station ID	Date	Total Solids (%)	Volatile Solids (%)	
Spring 2004				
No. locations sampled		36	36	72
No. samples rejected		0	0	0
% rejected		0%	0%	0%
% usable				**100%**