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Sampling Episode Report Holland America Oosterdam Sampling Episode 6506

Chapter 5 Data Quality

March 2006

5.0 DATA QUALITY

Quality assurance/quality control (QA/QC) procedures applicable to the Oosterdam sampling episode are outlined in the *Quality Assurance Project Plan for Rulemaking Support for Large Cruise Ships in Alaska Waters (QAPP)*, which is included in the Cruise Ship Rulemaking Record and is available upon request. This section describes the quality control practices used to assess the precision and accuracy of the analytical data presented in Section 4.0. Quality control (QC) practices used for this sampling episode include the analysis of matrix spikes, duplicate samples, and quality control standard checks.

5.1 Analytical Quality Control

EPA verified that laboratory performance was acceptable by conducting quality checks of the analytical data as specified by the QAPP. Data review chemists prepared written data review narratives (Appendix D) describing any qualifications of the analytical data. The following data were not considered to be of acceptable quality for the reasons discussed in Appendix D and were excluded from the data set:

- Three pathogen indicators:
 - *E. coli*, enterococci, and fecal coliform in sample 65861.
- Three volatile and semivolatile organics:
 - 2-chloroethylvinyl ether in samples 65876 and 65960; and
 - 3,3'-dichlorobenzidine and 4-nitrophenol in sample 65960.

5.1.1 Cyanide Results

There was uncertainty regarding the analytical results for available and total cyanide. Although the data have not been excluded from the database, the results are presented in Table 5-1 and not in the analytical results summary tables in Section 4.1. Available cyanide was detected in many samples, while total cyanide was not detected in these samples. In theory, the total cyanide results for any given sample will be greater than the available cyanide results in the same sample. Because it was not possible to determine which analysis was correct, EPA flagged the irreconcilable results in the database to alert users of the presence of such problems (see memoranda *Data Review Narrative for Classical Analyses for the Alaska Cruise Ship Industry Episode 6053* and *Issues Associated with Results for Total Cyanide Versus Available Cyanide* in Appendix D for a complete discussion).

EPA did not identify any known source of cyanide onboard the Oosterdam during its onboard interviews regarding activities that impact wastewater generation.

5.1.2 Ammonia Results

EPA considers the Oosterdam ammonia data to be anomalous because ammonia was either not detected or detected at very low concentrations in all samples of the influent to and effluent from treatment system. Although these data have not been excluded from the database, the results are presented in Table 5-2 and not in the analytical results summary tables in Section 4.1. Ammonia is produced within humans when proteins are digested and used by the body, and excess ammonia is excreted in urine. Therefore, ammonia is expected to be present in combined cruise vessel graywater and sewage. In general, 2004 compliance testing data provided by the U.S. Coast Guard (a total of 25 data points) for treated cruise ship wastewater showed ammonia concentrations generally ranging from 4 mg/L to 110 mg/L, with an average concentration of 31 mg/L; none of the ammonia concentrations were reported as nondetect.

It is important to note that EPA's review of the ammonia data for all four sampling episodes did not reveal any obvious errors. The quality control results from each

laboratory support the results provided and do not suggest any pervasive problems with the analyses (i.e., matrix spike recoveries and ongoing precision and recovery results were well within the acceptance limits, blanks were free of ammonia at the levels of interest). The Veendam and the Island ammonia were analyzed by a different laboratory than the Star and the Oosterdam ammonia samples.

EPA considers ammonia to be a critical analyte in characterizing graywater and sewage generation and treatment onboard cruise vessels. Accordingly, EPA believed it was necessary to collect additional ammonia data to better assess this analyte in cruise ship wastewater. During the 2005 cruise season, EPA conducted a supplementary sampling program to collect samples of the influents to and effluents from the treatment systems onboard the same four ships that were sampled in 2004. Five sets of samples were collected from each ship and analyzed for nitrogen compounds (ammonia, TKN, and nitrate/nitrite). Samples were also analyzed for chemical oxygen demand and total suspended solids to benchmark these classical pollutant concentrations to those measured during the 2004 cruise season. The 2005 sampling activities, including the analytical results, will be described in a separate sampling episode report.

5.2 Field Quality Control

The trip blank, equipment blank, and field duplicate sample results are the field QA/QC measures discussed in this subsection. Section 3.8 of the Oosterdam SAP discusses field QC specifications. Tables presented in this section include results for only those analytes detected in the field QC samples during the sampling episode. Appendix A-1 and A-2 contain the results for all analytes, both detected and nondetected.

5.2.1 Trip Blank

A trip blank was collected and analyzed for volatile organics to evaluate possible contamination during shipment and handling of samples. This sample consisted of high performance liquid chromatography (HPLC) water. The trip blank was prepared prior to the

start of the sampling episode, and accompanied samples shipped to the laboratory on September 22, 2004.

No volatile organics were detected in the trip blank, indicating that there was no contamination of samples during transport, field handling, storage, or shipping. A table with the results of the analyses in this section of the report was not included, because all results are nondetects.

5.2.2 Equipment Blank

The sampling team collected an equipment blank to assess the potential introduction of contaminants by sample collection equipment. The sample collection equipment used to collect the equipment blank was the same as that used at the sampling points: approximately 4 feet of Teflon® tubing connected on one end to a series of metal plumbing fixtures installed on each sample port, and the other end to a small segment of silicone tubing used in the peristaltic pump mechanism of the automatic sampler. The equipment blank was collected by pumping HPLC water through this equipment directly into sample bottles.

Table 5-3 presents the detected results for the equipment blank. Seven total metals, 6 dissolved metals, and one organic were detected in the equipment blank. Table 5-3 also includes a value for hardness (a classical analyte), which is calculated based on the total magnesium and calcium concentrations detected in the sample using Standard Method 2340B. In tables presenting the analytical results in Section 4.1, all 15 of these analytes are flagged with an “(e)” to indicate they were detected in the equipment blank. EPA will consider the impact of possible contamination from sampling equipment in a future analysis.

5.2.3 Field Duplicates

Field duplicate samples were collected to assess the precision of the entire sample collection, handling, preparation, and analysis process. The relative percent difference (RPD) between the two duplicate sample results is calculated and compared to the data quality

objective. For this program, the QAPP provides an RPD target for field duplicate samples as less than 30% for all analytes of a specific analytical method.

Classical Pollutants, Total and Dissolved Metals, and Semivolatile Organics

For classical pollutants, total and dissolved metals, and semivolatile organics, field duplicate samples were samples collected from the same source, at the same time, then stored and analyzed independently. The duplicate samples were collected as split samples poured from the same mixed sample composite jars to minimize sample wastestream variability. Duplicate samples for these analytes were collected from the effluents from the graywater treatment system (SP-8/9) and sewage/graywater treatment (SP-13/14). Note that duplicate samples for dioxins and furans, and pesticide analytes were collected during a previous sampling episode, and duplicate samples for HEM and SGT-HEM were not planned for this sampling program.

Table 5-4 presents analytical results and the RPDs for these duplicate samples and includes analytical results for only those analytes that were detected at least once in wastewater samples during the sampling episode.

There was excellent precision in sampling and analysis for this sampling episode. Of the 207 duplicate pairs listed in Table 5-4, 188 either achieved the RPD target, or the RPD could not be calculated because both of the duplicate samples were less than the reporting limit. The RPD could not be calculated for 12 of the duplicate pairs because the analyte was detected in one sample but not the other. Analytical variability increases as analyte concentrations approach their detection limits. The seven duplicate pairs with an RPD outside of the target (i.e., $\geq 30\%$ difference) include hardness, nitrate/nitrite (2 pairs), total manganese, phenol, and sulfate (2 pairs). These results are not uncommon in complex wastewater samples.

In tables presenting the analytical results in Section 4.1, duplicate sample results are presented as averages (calculation uses detection limits for nondetected results).

Pathogen Indicators and Volatile Organics

For pathogen indicators and volatile organics, field duplicate samples were collected sequentially and not as split samples as was done for the other analytes. For these samples, this methodology introduced sample wastestream variability into the assessment of the precision of sample collection and analysis. Duplicate samples for these analytes were collected from the effluent from the two treatment systems (SP-8/9 and SP-13/14). Table 5-5 presents analytical results and the RPDs for these duplicate samples. RPDs could not be calculated for 34 of the 36 duplicate pairs listed in Table 5-5 because both of the duplicate samples were less than the reporting limit. For the remaining two duplicate pairs (both fecal coliform in the effluent from the graywater treatment system), one achieved the QAPP-specified target (i.e., <30% difference) and one did not. Analytical variability increases as analyte concentrations approach their detection limits.

In tables presenting the analytical results in Section 4.1, duplicate sample results are presented as averages (calculation uses detection limits for nondetected results). In the case of pathogen indicators, average daily results presented incorporate both duplicate grab samples and multiple grab samples collected for individual analysis during each 24-hour sampling period. First, duplicate results, where applicable, were averaged to determine the average individual grab sample results for each day (e.g., grab 1 duplicate sample results for Day 3 were averaged together to represent the average grab 1 sample result for Day 3). Next, the individual grab sample results for each day were averaged to calculate the average daily pathogen indicators results presented in the tables (e.g., grab sample results 1 through 3 for Day 3 were averaged together to calculate the average Day 3 pathogen indicators sample results). In this way, the average daily pathogen indicators results presented in the tables are weighted equally by time of day, rather than weighted more heavily by the particular time of day when duplicate grab samples were collected.

Table 5-1

Available and Total Cyanide Analytical Results, Holland America Oosterdam

Available and total cyanide analytical results are irreconcilable; see Section 5.1.1.

Waste Stream	Available Cyanide (ug/L)	Total Cyanide (mg/L)
Accommodations (SP-1)	4.20	ND(0.00500)
Laundry (SP-2)	11.6	0.00700
Galley (SP-3)	ND(2.00)	ND(0.00500)
Food Pulper, Centrifuge System (SP-5)	0.0534	ND(0.249)
Influent to GW Treatment (SP-6), Day 1	3.91	ND(0.00500)
Influent to GW Treatment (SP-6), Day 2	2.84	ND(0.00500)
Influent to GW Treatment (SP-6), Day 3	3.18	ND(0.00500)
Influent to GW Treatment (SP-6), Day 4	3.35	ND(0.00500)
Influent to GW Treatment (SP-6), Day 5	2.21	ND(0.00500)
Effluent from GW Treatment (SP-8), Day 1	3.49	ND(0.00500)
Effluent from GW Treatment (SP-8), Day 2	2.31	ND(0.00500)
Effluent from GW Treatment (SP-8), Day 3	7.55	ND(0.00500)
Effluent from GW Treatment (SP-8), Day 4	ND(2.00)	ND(0.00500)
Effluent from GW Treatment (SP-8), Day 5	ND(2.00)	ND(0.00500)
Influent to Sewage/GW Treatment (SP-11), Day 1	45.5	ND(0.00500)
Influent to Sewage/GW Treatment (SP-11), Day 2	36.2	ND(0.00500)
Influent to Sewage/GW Treatment (SP-11), Day 3	75.6	ND(0.00500)
Influent to Sewage/GW Treatment (SP-11), Day 4	72.2	ND(0.00500)
Influent to Sewage/GW Treatment (SP-11), Day 5	76.5	ND(0.00500)
Effluent from Sewage/GW Treatment (SP-13), Day 1	< 3.04	< 0.00550
Effluent from Sewage/GW Treatment (SP-13), Day 2	4.41	ND(0.00500)
Effluent from Sewage/GW Treatment (SP-13), Day 3	3.49	ND(0.00500)
Effluent from Sewage/GW Treatment (SP-13), Day 4	3.22	ND(0.00500)
Effluent from Sewage/GW Treatment (SP-13), Day 5	3.34	ND(0.00500)
Graywater Screening Solids (SP-15)	0.474	ND(0.250)
Final Combined Discharge (SP-16), Day 1	ND(2.00)	ND(0.00500)
Final Combined Discharge (SP-16), Day 2	ND(2.00)	ND(0.00500)
Final Combined Discharge (SP-16), Day 3	7.60	ND(0.00500)
Final Combined Discharge (SP-16), Day 4	ND(2.00)	ND(0.00500)
Final Combined Discharge (SP-16), Day 5	9.00	ND(0.00500)

ND - Not detected (number in parentheses is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-1 (Continued)

Waste Stream	Available Cyanide (ug/L)	Total Cyanide (mg/L)
Sewage/GW Screening Solids (SP-20)	9.20	ND(0.250)
Sewage/GW Waste Biosludge (SP-21)	493	ND(0.251)
Source Water (SP-17)	ND(2.00)	ND(0.00500)

ND - Not detected (number in parentheses is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-2

Ammonia Analytical Results, Holland America Oosterdam

Ammonia analytical results are anomalous; see Section 5.1.2

Waste Stream	Ammonia as Nitrogen (mg/L)
Accommodations (SP-1)	ND(0.0500)
Laundry (SP-2)	ND(0.0500)
Galley (SP-3)	ND(0.0500)
Food Pulper, Centrifuge System (SP-5)	5.96
Influent to GW Treatment (SP-6), Day 1	ND(0.0500)
Influent to GW Treatment (SP-6), Day 2	ND(0.0500)
Influent to GW Treatment (SP-6), Day 3	ND(0.0500)
Influent to GW Treatment (SP-6), Day 4	ND(0.0500)
Influent to GW Treatment (SP-6), Day 5	ND(0.0500)
Effluent from GW Treatment (SP-8), Day 1	ND(0.0500)
Effluent from GW Treatment (SP-8), Day 2	ND(0.0500)
Effluent from GW Treatment (SP-8), Day 3	ND(0.0500)
Effluent from GW Treatment (SP-8), Day 4	< 0.0900
Effluent from GW Treatment (SP-8), Day 5	ND(0.0500)
Influent to Sewage/GW Treatment (SP-11), Day 1	ND(0.0500)
Influent to Sewage/GW Treatment (SP-11), Day 2	ND(0.0500)
Influent to Sewage/GW Treatment (SP-11), Day 3	ND(0.0500)
Influent to Sewage/GW Treatment (SP-11), Day 4	ND(0.0500)
Influent to Sewage/GW Treatment (SP-11), Day 5	ND(0.0500)
Effluent from Sewage/GW Treatment (SP-13), Day 1	2.49
Effluent from Sewage/GW Treatment (SP-13), Day 2	0.160
Effluent from Sewage/GW Treatment (SP-13), Day 3	0.0800
Effluent from Sewage/GW Treatment (SP-13), Day 4	< 0.0700
Effluent from Sewage/GW Treatment (SP-13), Day 5	ND(0.0500)
Graywater Screening Solids (SP-15)	148
Final Combined Discharge (SP-16), Day 1	ND(0.0500)
Final Combined Discharge (SP-16), Day 2	ND(0.0500)
Final Combined Discharge (SP-16), Day 3	ND(0.0500)
Final Combined Discharge (SP-16), Day 4	ND(0.0500)
Final Combined Discharge (SP-16), Day 5	ND(0.0500)

ND - Not detected (number in parentheses is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-2 (Continued)

Waste Stream	Ammonia as Nitrogen (mg/L)
Sewage/GW Screening Solids (SP-20)	7.33
Sewage/GW Waste Biosludge (SP-21)	136
Source Water (SP-17)	ND(0.0500)

ND - Not detected (number in parentheses is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-3

Equipment Blank Analytical Results, Holland America Oosterdam

Analytical results for analytes detected in the equipment blank. See Appendix A-2 for all analytical results (detected and nondetected). The equipment blank was collected as a one-time grab sample. Priority pollutants (designated by EPA in 40 CFR Part 423, Appendix A) are identified where applicable.

Analyte	Unit	Priority Pollutant Code	Equipment Blank (SP-19)
Classical Pollutants			
Hardness	mg/L		0.300
Total and Dissolved Metals			
Barium, Total	ug/L		18.9
Calcium, Total	ug/L		119
Copper, Total	ug/L	P120	3.41
Iron, Total	ug/L		30.2
Lead, Total	ug/L	P122	12.6
Manganese, Total	ug/L		0.720
Zinc, Total	ug/L	P128	13.3
Barium, Dissolved	ug/L		0.390
Boron, Dissolved	ug/L		24.3
Cadmium, Dissolved	ug/L	P118	0.210
Iron, Dissolved	ug/L		15.2
Lead, Dissolved	ug/L	P122	16.6
Sodium, Dissolved	ug/L		83.9
Volatile and Semivolatile Organics			
Phenol	ug/L	P065	48.0

Table 5-4

Field Duplicate Analytical Results for Classical Pollutants, Total and Dissolved Metals, and Semivolatile Organics, Holland America Oosterdam

Field duplicate analytical results for classical pollutants, total and dissolved metals, and semivolatile organics, detected at least once in wastewater samples during the sampling episode. See Appendix A-2 for all field duplicate analytical results (detected and nondetected). Field duplicate samples for these analytes are split samples collected from the same source, at the same time, stored and analyzed independently. See Figures 2-2 and 2-3 for sampling point locations. Also listed are the average result and relative percent difference calculated for each duplicate pair. Priority pollutants (designated by EPA in 40 CFR Part 423, Appendix A) are identified where applicable.

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Graywater Treatment (SP-8/9) (b)	Classical Pollutants								
	Alkalinity	mg/L		65860	65880	ND (10.0)	ND (10.0)	ND (10.0)	NC
	Ammonia As Nitrogen (NH3-N)	mg/L		65864	65884	ND (0.0500)	0.130	< 0.0900	NC
	Ammonia As Nitrogen (NH3-N)	mg/L		65868	65888	ND (0.0500)	ND (0.0500)	ND (0.0500)	NC
	Available Cyanide	ug/L		65852	65872	3.57	3.33	3.49	7.0
	Available Cyanide	ug/L		65860	65880	7.48	7.68	7.55	2.6
	Biochemical Oxygen Demand (BOD ₅)	mg/L		65856	65876	25.9	29.4	27.1	13
	Biochemical Oxygen Demand (BOD ₅)	mg/L		65864	65884	23.9	22.5	23.2	6.0
	Chemical Oxygen Demand (COD) (s)	mg/L		65864	65884	48.0	53.0	50.5	9.9
	Chemical Oxygen Demand (COD) (s)	mg/L		65868	65888	77.0	81.0	79.0	5.1
	Chloride (s)	mg/L		65860	65880	17.0	17.0	17.0	0.0
	Hardness (e) (s)	mg/L		65860	65880	0.440	0.290	0.390	41

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Graywater Treatment (SP-8/9) (cont.) (b)	Nitrate/Nitrite (NO ₂ -N + NO ₃ -N) (s)	mg/L		65864	65884	0.0380	0.0160	0.0270	81
	Nitrate/Nitrite (NO ₂ -N + NO ₃ -N) (s)	mg/L		65868	65888	0.0160	0.0380	0.0270	81
	Settleable Residue	mL/L		65868	65888	ND (0.110)	ND (0.100)	ND (0.105)	NC
	Sulfate (s)	mg/L		65860	65880	4.17	4.17	4.17	0.0
	Total Cyanide	mg/L	P121	65852	65872	ND (0.00500)	ND (0.00500)	ND (0.00500)	NC
	Total Cyanide	mg/L	P121	65860	65880	ND (0.00500)	ND (0.00500)	ND (0.00500)	NC
	Total Dissolved Solids (TDS)	mg/L		65860	65880	52.0	56.0	53.3	7.4
	Total Kjeldahl Nitrogen (TKN) (s)	mg/L		65864	65884	6.49	6.99	6.74	7.4
	Total Kjeldahl Nitrogen (TKN) (s)	mg/L		65868	65888	3.38	3.33	3.36	1.5
	Total Organic Carbon (TOC) (s)	mg/L		65864	65884	13.3	13.4	13.4	0.75
	Total Organic Carbon (TOC) (s)	mg/L		65868	65888	20.4	21.5	21.0	5.3
	Total Phosphorus	mg/L		65864	65884	0.170	0.170	0.170	0.0
	Total Phosphorus	mg/L		65868	65888	0.210	0.230	0.220	9.1
	Total Suspended Solids (TSS)	mg/L		65860	65880	ND (5.00)	ND (5.00)	ND (5.00)	NC
	Total and Dissolved Metals								
	Aluminum, Total	ug/L		65860	65880	ND (8.80)	ND (8.80)	ND (8.80)	NC
	Aluminum, Dissolved	ug/L		65860	65880	ND (8.80)	33.1	< 16.9	NC
	Antimony, Dissolved	ug/L	P114	65860	65880	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Arsenic, Total	ug/L	P115	65860	65880	ND (2.00)	ND (2.00)	ND (2.00)	NC

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Graywater Treatment (SP-8/9) (cont.) (b)	Arsenic, Dissolved	ug/L	P115	65860	65880	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Barium, Total (e) (s)	ug/L		65860	65880	11.9	9.66	11.2	21
	Barium, Dissolved (e) (s)	ug/L		65860	65880	7.34	9.51	8.06	26
	Beryllium, Dissolved	ug/L	P117	65860	65880	ND (0.0700)	ND (0.0700)	ND (0.0700)	NC
	Boron, Total	ug/L		65860	65880	ND (18.0)	ND (18.0)	ND (18.0)	NC
	Boron, Dissolved (e)	ug/L		65860	65880	74.3	72.1	73.6	3.0
	Cadmium, Total	ug/L	P118	65860	65880	0.0900	ND (0.0800)	< 0.0867	NC
	Cadmium, Dissolved (e)	ug/L	P118	65860	65880	ND (0.0800)	ND (0.0800)	ND (0.0800)	NC
	Calcium, Total (e) (s)	ug/L		65860	65880	117	103	112	13
	Calcium, Dissolved (s)	ug/L		65860	65880	ND (7.00)	ND (7.00)	ND (7.00)	NC
	Chromium, Total	ug/L	P119	65860	65880	ND (0.270)	ND (0.270)	ND (0.270)	NC
	Chromium, Dissolved	ug/L	P119	65860	65880	0.410	0.500	0.440	20
	Cobalt, Total	ug/L		65860	65880	ND (0.660)	ND (0.660)	ND (0.660)	NC
	Cobalt, Dissolved (s)	ug/L		65860	65880	ND (0.660)	ND (0.660)	ND (0.660)	NC
	Copper, Total (e) (s)	ug/L	P120	65860	65880	172	157	167	9.1
	Copper, Dissolved (s)	ug/L	P120	65860	65880	46.9	47.2	47.0	0.64
	Iron, Total (e) (s)	ug/L		65860	65880	490	427	469	14
	Iron, Dissolved (e)	ug/L		65860	65880	436	463	445	6.0
	Lead, Total (e) (s)	ug/L	P122	65860	65880	30.3	25.0	28.5	19

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Graywater Treatment (SP-8/9) (cont.) (b)	Lead, Dissolved (e) (s)	ug/L	P122	65860	65880	14.7	14.9	14.8	1.4
	Magnesium, Total (s)	ug/L		65860	65880	34.9	33.4	34.4	4.4
	Magnesium, Dissolved (s)	ug/L		65860	65880	ND (6.30)	ND (6.30)	ND (6.30)	NC
	Manganese, Total (e) (s)	ug/L		65860	65880	8.16	227	81.1	190
	Manganese, Dissolved (s)	ug/L		65860	65880	8.13	8.20	8.15	0.86
	Mercury, Total	ug/L	P123	65860	65880	ND (0.0500)	ND (0.0500)	ND (0.0500)	NC
	Mercury, Dissolved	ug/L	P123	65860	65880	ND (0.0500)	ND (0.0500)	ND (0.0500)	NC
	Molybdenum, Total	ug/L		65860	65880	ND (1.60)	ND (1.60)	ND (1.60)	NC
	Nickel, Total (s)	ug/L	P124	65860	65880	3.09	2.80	2.99	9.8
	Nickel, Dissolved (s)	ug/L	P124	65860	65880	3.90	4.65	4.15	18
	Selenium, Total	ug/L	P125	65860	65880	ND (1.40)	ND (1.40)	ND (1.40)	NC
	Silver, Total	ug/L	P126	65860	65880	ND (0.770)	ND (0.770)	ND (0.770)	NC
	Silver, Dissolved	ug/L	P126	65860	65880	ND (0.770)	ND (0.770)	ND (0.770)	NC
	Sodium, Total (s)	ug/L		65860	65880	11,600	10,600	11,300	9.0
	Sodium, Dissolved (e) (s)	ug/L		65860	65880	12,000	12,400	12,100	3.3
	Tin, Total	ug/L		65860	65880	ND (0.940)	ND (0.940)	ND (0.940)	NC
	Tin, Dissolved	ug/L		65860	65880	ND (0.940)	ND (0.940)	ND (0.940)	NC
	Titanium, Total	ug/L		65860	65880	ND (0.620)	ND (0.620)	ND (0.620)	NC
	Titanium, Dissolved	ug/L		65860	65880	ND (0.620)	ND (0.620)	ND (0.620)	NC

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Graywater Treatment (SP-8/9) (cont.) (b)	Vanadium, Total	ug/L		65860	65880	ND (0.470)	ND (0.470)	ND (0.470)	NC
	Vanadium, Dissolved	ug/L		65860	65880	ND (0.470)	ND (0.470)	ND (0.470)	NC
	Zinc, Total (e) (s)	ug/L	P128	65860	65880	702	621	675	12
	Zinc, Dissolved (s)	ug/L	P128	65860	65880	594	626	605	5.2
	Semivolatile Organics								
	4-Chloro-3-methylphenol	ug/L	P022	65852	65872	ND (20.0)	ND (20.0)	ND (20.0)	NC
	4-Chloro-3-methylphenol	ug/L	P022	65856	65876	ND (20.0)	ND (20.0)	ND (20.0)	NC
	Bis(2-ethylhexyl) phthalate	ug/L	P066	65852	65872	ND (20.0)	ND (20.0)	ND (20.0)	NC
	Bis(2-ethylhexyl) phthalate	ug/L	P066	65856	65876	ND (20.0)	ND (20.0)	ND (20.0)	NC
	Diethyl phthalate	ug/L	P070	65852	65872	ND (20.0)	ND (20.0)	ND (20.0)	NC
	Diethyl phthalate	ug/L	P070	65856	65876	ND (20.0)	ND (20.0)	ND (20.0)	NC
	Phenol (e) (s)	ug/L	P065	65852	65872	60.0	65.0	61.7	8.0
	Phenol (e) (s)	ug/L	P065	65856	65876	71.0	51.0	64.3	33

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Sewage/Graywater Treatment (SP-13/14) (b)	Classical Pollutants								
	Alkalinity	mg/L		65944	65964	321	315	319	1.9
	Alkalinity	mg/L		65952	65972	332	349	338	5.0
	Ammonia As Nitrogen (NH3-N)	mg/L		65948	65968	0.0800	ND (0.0500)	< 0.0700	NC
	Available Cyanide	ug/L		65936	65956	4.08	ND (2.00)	< 3.04	NC
	Biochemical Oxygen Demand (BOD ₅)	mg/L		65948	65968	4.42	3.90	4.25	13
	Chemical Oxygen Demand (COD) (s)	mg/L		65948	65968	111	104	109	6.5
	Chloride (s)	mg/L		65944	65964	125	125	125	0.0
	Chloride (s)	mg/L		65952	65972	145	135	142	7.1
	Hardness (e) (s)	mg/L		65936	65956	37.6	37.8	37.7	0.53
	Hardness (e) (s)	mg/L		65944	65964	32.2	34.6	33.0	7.2
	Nitrate/Nitrite (NO2-N + NO3-N) (s)	mg/L		65948	65968	0.0310	0.0350	0.0323	12
	Settleable Residue	mL/L		65936	65956	ND (0.100)	ND (0.130)	ND (0.115)	NC
	Settleable Residue	mL/L		65952	65972	ND (0.100)	ND (0.110)	ND (0.103)	NC

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Sewage/Graywater Treatment (SP-13/14) (cont.) (b)	Sulfate (s)	mg/L		65944	65964	52.4	34.7	46.5	41
	Sulfate (s)	mg/L		65952	65972	14.6	45.4	24.9	100
	Total Cyanide	mg/L	P121	65936	65956	ND (0.00500)	0.00600	< 0.00550	NC
	Total Dissolved Solids (TDS)	mg/L		65944	65964	444	439	442	1.1
	Total Dissolved Solids (TDS)	mg/L		65952	65972	511	517	513	1.2
	Total Kjeldahl Nitrogen (TKN) (s)	mg/L		65948	65968	73.3	70.6	72.4	3.8
	Total Organic Carbon (TOC) (s)	mg/L		65948	65968	30.5	29.6	30.2	3.0
	Total Phosphorus	mg/L		65948	65968	10.4	11.3	10.7	8.3
	Total Suspended Solids (TSS)	mg/L		65944	65964	ND (5.00)	ND (5.00)	ND (5.00)	NC
	Total Suspended Solids (TSS)	mg/L		65952	65972	ND (5.00)	ND (5.00)	ND (5.00)	NC
	Total and Dissolved Metals								
	Aluminum, Total	ug/L		65936	65956	126	123	125	2.4
	Aluminum, Total	ug/L		65944	65964	75.3	80.2	76.9	6.3
	Aluminum, Dissolved	ug/L		65936	65956	114	111	113	2.7
	Aluminum, Dissolved	ug/L		65944	65964	77.5	80.1	78.4	3.3
	Antimony, Dissolved	ug/L	P114	65936	65956	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Antimony, Dissolved	ug/L	P114	65944	65964	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Arsenic, Total	ug/L	P115	65936	65956	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Arsenic, Total	ug/L	P115	65944	65964	ND (2.00)	ND (2.00)	ND (2.00)	NC

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Sewage/Graywater Treatment (SP-13/14) (cont.) (b)	Arsenic, Dissolved	ug/L	P115	65936	65956	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Arsenic, Dissolved	ug/L	P115	65944	65964	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Barium, Total (e) (s)	ug/L		65936	65956	76.0	78.3	77.2	3.0
	Barium, Total (e) (s)	ug/L		65944	65964	75.2	79.9	76.8	6.1
	Barium, Dissolved (e) (s)	ug/L		65936	65956	69.7	70.4	70.1	1.0
	Barium, Dissolved (e) (s)	ug/L		65944	65964	73.6	75.4	74.2	2.4
	Beryllium, Dissolved	ug/L	P117	65936	65956	ND (0.0700)	ND (0.0700)	ND (0.0700)	NC
	Beryllium, Dissolved	ug/L	P117	65944	65964	ND (0.0700)	ND (0.0700)	ND (0.0700)	NC
	Boron, Total	ug/L		65936	65956	ND (18.0)	ND (18.0)	ND (18.0)	NC
	Boron, Total	ug/L		65944	65964	158	157	158	0.63
	Boron, Dissolved (e)	ug/L		65936	65956	118	156	137	28
	Boron, Dissolved (e)	ug/L		65944	65964	ND (18.0)	ND (18.0)	ND (18.0)	NC
	Cadmium, Total	ug/L	P118	65936	65956	0.110	0.100	0.105	9.5
	Cadmium, Total	ug/L	P118	65944	65964	ND (0.0800)	ND (0.0800)	ND (0.0800)	NC
	Cadmium, Dissolved (e)	ug/L	P118	65936	65956	0.130	ND (0.0800)	< 0.105	NC
	Cadmium, Dissolved (e)	ug/L	P118	65944	65964	ND (0.0800)	ND (0.0800)	ND (0.0800)	NC
	Calcium, Total (e) (s)	ug/L		65936	65956	9,560	9,590	9,580	0.31
	Calcium, Total (e) (s)	ug/L		65944	65964	8,600	9,190	8,800	6.6

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Sewage/Graywater Treatment (SP-13/14) (cont.) (b)	Calcium, Dissolved (s)	ug/L		65936	65956	8,630	8,740	8,690	1.3
	Calcium, Dissolved (s)	ug/L		65944	65964	8,090	8,340	8,170	3.0
	Chromium, Total	ug/L	P119	65936	65956	0.800	0.700	0.750	13
	Chromium, Total	ug/L	P119	65944	65964	1.81	2.15	1.92	17
	Chromium, Dissolved	ug/L	P119	65936	65956	1.44	1.20	1.32	18
	Chromium, Dissolved	ug/L	P119	65944	65964	1.32	1.40	1.35	5.9
	Cobalt, Total	ug/L		65936	65956	ND (0.660)	ND (0.660)	ND (0.660)	NC
	Cobalt, Total	ug/L		65944	65964	ND (0.660)	ND (0.660)	ND (0.660)	NC
	Cobalt, Dissolved (s)	ug/L		65936	65956	ND (0.660)	ND (0.660)	ND (0.660)	NC
	Cobalt, Dissolved (s)	ug/L		65944	65964	ND (0.660)	3.07	< 1.46	NC
	Copper, Total (e) (s)	ug/L	P120	65936	65956	65.7	51.7	58.7	24
	Copper, Total (e) (s)	ug/L	P120	65944	65964	5.92	5.60	5.81	5.6
	Copper, Dissolved (s)	ug/L	P120	65936	65956	58.6	49.1	53.9	18
	Copper, Dissolved (s)	ug/L	P120	65944	65964	4.65	4.70	4.67	1.1
	Iron, Total (e) (s)	ug/L		65936	65956	773	742	758	4.1
	Iron, Total (e) (s)	ug/L		65944	65964	266	279	270	4.8
	Iron, Dissolved (e)	ug/L		65936	65956	801	760	781	5.3
	Iron, Dissolved (e)	ug/L		65944	65964	293	235	274	22
	Lead, Total (e) (s)	ug/L	P122	65936	65956	8.43	6.68	7.56	23
	Lead, Total (e) (s)	ug/L	P122	65944	65964	2.05	2.20	2.10	7.1

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Sewage/Graywater Treatment (SP-13/14) (cont.) (b)	Lead, Dissolved (e) (s)	ug/L	P122	65936	65956	7.43	6.41	6.92	15
	Lead, Dissolved (e) (s)	ug/L	P122	65944	65964	1.76	1.60	1.71	9.5
	Magnesium, Total (s)	ug/L		65936	65956	3,340	3,360	3,350	0.60
	Magnesium, Total (s)	ug/L		65944	65964	2,620	2,830	2,690	7.7
	Magnesium, Dissolved (s)	ug/L		65936	65956	3,020	3,080	3,050	2.0
	Magnesium, Dissolved (s)	ug/L		65944	65964	2,530	2,690	2,580	6.1
	Manganese, Total (e) (s)	ug/L		65936	65956	54.6	50.8	52.7	7.2
	Manganese, Total (e) (s)	ug/L		65944	65964	14.4	15.5	14.8	7.4
	Manganese, Dissolved (s)	ug/L		65936	65956	51.1	48.1	49.6	6.0
	Manganese, Dissolved (s)	ug/L		65944	65964	16.4	19.0	17.3	15
	Mercury, Total	ug/L	P123	65936	65956	ND (0.0500)	ND (0.0500)	ND (0.0500)	NC
	Mercury, Total	ug/L	P123	65944	65964	ND (0.0500)	ND (0.0500)	ND (0.0500)	NC
	Mercury, Dissolved	ug/L	P123	65936	65956	0.0610	ND (0.0500)	< 0.0555	NC
	Mercury, Dissolved	ug/L	P123	65944	65964	0.0770	ND (0.0500)	< 0.0680	NC
	Molybdenum, Total	ug/L		65936	65956	ND (1.60)	ND (1.60)	ND (1.60)	NC
	Molybdenum, Total	ug/L		65944	65964	ND (1.60)	ND (1.60)	ND (1.60)	NC
	Nickel, Total (s)	ug/L	P124	65936	65956	25.4	23.9	24.7	6.1
	Nickel, Total (s)	ug/L	P124	65944	65964	24.3	26.9	25.2	10
	Nickel, Dissolved (s)	ug/L	P124	65936	65956	25.0	24.2	24.6	3.3
	Nickel, Dissolved (s)	ug/L	P124	65944	65964	22.9	22.7	22.8	0.88

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Sewage/Graywater Treatment (SP-13/14) (cont.) (b)	Selenium, Total	ug/L	P125	65936	65956	ND (1.40)	ND (1.40)	ND (1.40)	NC
	Selenium, Total	ug/L	P125	65944	65964	ND (1.40)	3.73	< 2.18	NC
	Silver, Total	ug/L	P126	65936	65956	ND (0.770)	ND (0.770)	ND (0.770)	NC
	Silver, Total	ug/L	P126	65944	65964	ND (0.770)	ND (0.770)	ND (0.770)	NC
	Silver, Dissolved	ug/L	P126	65936	65956	ND (0.770)	ND (0.770)	ND (0.770)	NC
	Silver, Dissolved	ug/L	P126	65944	65964	ND (0.770)	ND (0.770)	ND (0.770)	NC
	Sodium, Total (s)	ug/L		65936	65956	103,000	103,000	103,000	0.0
	Sodium, Total (s)	ug/L		65944	65964	104,000	110,000	106,000	5.6
	Sodium, Dissolved (e) (s)	ug/L		65936	65956	104,000	101,000	103,000	2.9
	Sodium, Dissolved (e) (s)	ug/L		65944	65964	93,900	94,300	94,000	0.43
	Tin, Total	ug/L		65936	65956	ND (0.940)	ND (0.940)	ND (0.940)	NC
	Tin, Total	ug/L		65944	65964	ND (0.940)	1.10	< 0.993	NC
	Tin, Dissolved	ug/L		65936	65956	ND (0.940)	ND (0.940)	ND (0.940)	NC
	Tin, Dissolved	ug/L		65944	65964	ND (0.940)	ND (0.940)	ND (0.940)	NC
	Titanium, Total	ug/L		65936	65956	ND (0.620)	ND (0.620)	ND (0.620)	NC
	Titanium, Total	ug/L		65944	65964	ND (0.620)	ND (0.620)	ND (0.620)	NC
	Titanium, Dissolved	ug/L		65936	65956	ND (0.620)	ND (0.620)	ND (0.620)	NC
	Titanium, Dissolved	ug/L		65944	65964	ND (0.620)	ND (0.620)	ND (0.620)	NC
	Vanadium, Total	ug/L		65936	65956	ND (0.470)	ND (0.470)	ND (0.470)	NC
	Vanadium, Total	ug/L		65944	65964	ND (0.470)	ND (0.470)	ND (0.470)	NC

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Waste Stream	Analyte	Unit	Priority Pollutant Code	SCC Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Sewage/Graywater Treatment (SP-13/14) (cont.) (b)	Vanadium, Dissolved	ug/L		65936	65956	ND (0.470)	ND (0.470)	ND (0.470)	NC
	Vanadium, Dissolved	ug/L		65944	65964	ND (0.470)	ND (0.470)	ND (0.470)	NC
	Zinc, Total (e) (s)	ug/L	P128	65936	65956	955	854	905	11
	Zinc, Total (e) (s)	ug/L	P128	65944	65964	354	380	363	7.1
	Zinc, Dissolved (s)	ug/L	P128	65936	65956	884	813	849	8.4
	Zinc, Dissolved (s)	ug/L	P128	65944	65964	358	345	354	3.7
	Semivolatile Organics								
	4-Chloro-3-methylphenol	ug/L	P022	65940	65960	ND (10.0)	ND (10.0)	ND (10.0)	NC
	Bis(2-ethylhexyl) phthalate	ug/L	P066	65940	65960	ND (10.0)	ND (10.0)	ND (10.0)	NC
	Diethyl phthalate	ug/L	P070	65940	65960	ND (10.0)	ND (10.0)	ND (10.0)	NC
	Phenol (e) (s)	ug/L	P065	65940	65960	60.0	60.0	60.0	0.0

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-5

Field Duplicate Analytical Results for Pathogen Indicators and Volatile Organics, Holland America Oosterdam

Field duplicate analytical results for pathogen indicators and volatile organics detected at least once in wastewater samples during the sampling episode. Field duplicate samples were collected from the same source, stored, and analyzed independently. See Figures 2-2 and 2-3 for sampling point locations. Also listed are the average result and relative percent difference calculated for each duplicate pair. Priority pollutants (designated by EPA in 40 CFR Part 423, Appendix A) are identified where applicable.

Waste Stream	Analyte	Unit	Sample Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Graywater Treatment (SP-8/9) (b)	Pathogen Indicators							
	E. coli	MPN/100 mL	65852	65872	ND (1.00)	ND (1.00)	ND (1.00)	NC
	E. coli	MPN/100 mL	65856	65876	ND (1.00)	ND (1.00)	ND (1.00)	NC
	E. coli	MPN/100 mL	65860	65880	ND (1.00)	ND (1.00)	ND (1.00)	NC
	E. coli	MPN/100 mL	65852	66014	ND (1.00)	ND (1.00)	ND (1.00)	NC
	E. coli	MPN/100 mL	65856	66015	ND (1.00)	ND (1.00)	ND (1.00)	NC
	E. coli	MPN/100 mL	65860	66016	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65852	65872	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65856	65876	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65860	65880	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65852	66014	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65856	66015	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65860	66016	ND (1.00)	ND (1.00)	ND (1.00)	NC

(a) Sample numbers identify corresponding analytical results in Appendices A-1 and A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory reporting limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-5 (Continued)

Waste Stream	Analyte	Unit	Sample Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Graywater Treatment (SP-8/9) (b) (cont.)	Fecal Coliform	CFU/100 mL	65852	65872	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Fecal Coliform	CFU/100 mL	65856	65876	1.00	1.00	1.00	0.0
	Fecal Coliform	CFU/100 mL	65860	65880	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Fecal Coliform	CFU/100 mL	65852	66014	ND (1.00)	1.00	< 1.00	NC
	Fecal Coliform	CFU/100 mL	65856	66015	1.00	2.00	1.50	67
	Fecal Coliform	CFU/100 mL	65860	66016	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Volatile Organics							
	Chloroform (s)	ug/L	65856	65876	ND(5.00)	ND(5.00)	ND(5.00)	NC
	Ethylbenzene	ug/L	65856	65876	ND(5.00)	ND(5.00)	ND(5.00)	NC
	Toluene	ug/L	65856	65876	ND(5.00)	ND(5.00)	ND(5.00)	NC
Effluent from Sewage/Graywater Treatment (SP-13/14) (b)	Pathogen Indicators							
	<i>E. coli</i>	MPN/100 mL	65944	65964	ND (1.00)	ND (1.00)	ND (1.00)	NC
	<i>E. coli</i>	MPN/100 mL	65948	65968	ND (1.00)	ND (1.00)	ND (1.00)	NC
	<i>E. coli</i>	MPN/100 mL	65952	65972	ND (1.00)	ND (1.00)	ND (1.00)	NC
	<i>E. coli</i>	MPN/100 mL	65944	66011	ND (1.00)	ND (1.00)	ND (1.00)	NC
	<i>E. coli</i>	MPN/100 mL	65948	66012	ND (1.00)	ND (1.00)	ND (1.00)	NC
	<i>E. coli</i>	MPN/100 mL	65952	66013	ND (1.00)	ND (1.00)	ND (1.00)	NC

(a) Sample numbers identify corresponding analytical results in Appendices A-1 and A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory reporting limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-5 (Continued)

Waste Stream	Analyte	Unit	Sample Numbers (a)		Original	Duplicate	Average	Relative Percent Difference
Effluent from Sewage/Graywater Treatment (SP-13/14) (b) (cont.)	Enterococci	MPN/100 mL	65944	65964	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65948	65968	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65952	65972	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65944	66011	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65948	66012	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Enterococci	MPN/100 mL	65952	66013	ND (1.00)	ND (1.00)	ND (1.00)	NC
	Fecal Coliform	CFU/100 mL	65944	65964	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Fecal Coliform	CFU/100 mL	65948	65968	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Fecal Coliform	CFU/100 mL	65952	65972	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Fecal Coliform	CFU/100 mL	65944	66011	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Fecal Coliform	CFU/100 mL	65948	66012	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Fecal Coliform	CFU/100 mL	65952	66013	ND (2.00)	ND (2.00)	ND (2.00)	NC
	Volatile Organics							
	Chloroform (s)	ug/L	65940	65960	ND(5.00)	ND(5.00)	ND(5.00)	NC
	Chloroform (s)	ug/L	65948	65968	ND(5.00)	ND(5.00)	ND(5.00)	NC
	Ethylbenzene	ug/L	65940	65960	ND(5.00)	ND(5.00)	ND(5.00)	NC
	Ethylbenzene	ug/L	65948	65968	ND(5.00)	ND(5.00)	ND(5.00)	NC
	Toluene	ug/L	65940	65960	ND(5.00)	ND(5.00)	ND(5.00)	NC
	Toluene	ug/L	65948	65968	ND(5.00)	ND(5.00)	ND(5.00)	NC

(a) Sample numbers identify corresponding analytical results in Appendices A-1 and A-2.

(b) Sampling point location; See Figure 2-2 and Figure 2-3.

(e) Analyte detected at some level in equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in source water. See Section 4.1.12 and Table 4-14 for source water results.

NC - Not calculated because one or both of the sample results is less than the laboratory reporting limit.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).