Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program

Annual Monitoring Report - Year Four, April 2003

Elliott Bay/Duwamish Restoration Program

Prepared for the
Elliott Bay/Duwamish Restoration Program Panel
by the
King County Department of Natural Resources

Panel Publication 33

October 2003

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by
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Panel Publication 33

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The Panel of Managers holds regularly scheduled meetings that are open to the public. Technical Working Group and committee meetings are scheduled on an as-needed basis, and are also open to the public. Meetings are generally held at the National Oceanic and Atmospheric Administration, National Marine Fisheries Service - Regional Directorate Conference Room, Building 1, 7600 Sand Point Way NE, Seattle. The Panel recommends that you contact the Administrative Director at the above phone number to confirm meeting schedules and locations. The panel also holds periodic special evening and weekend public information meetings and workshops.

General Schedule for Panel and Committee Meeting Dates

Panel: quarterly, first Thursday of January, April, July, October, 9:30 A.M. - 12:30 P.M.
Habitat Development Technical Working Group: scheduled as needed.
Sediment Remediation Technical Working Group: scheduled as needed.
Public Participation Committee: scheduled as needed.
Budget Committee: scheduled as needed.

Environmental Review of Specific Projects

Formal hearings and comment periods on appropriate environmental documents for proposed sediment remediation and habitat development projects will be observed. Please contact the Administrative Director for more information.

This information is available in accessible formats on request at
(206) 296-0600 (voice) and 1-800-833-6388 (TTY/TDD users only).

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1 INTRODUCTION

This report presents results for the year-four sampling event of a five-year monitoring program at the Norfolk combined sewer overflow (CSO) sediment remediation site. The purpose of the five-year program is to monitor sediment placed as backfill material at the site for potential recontamination from CSO and other discharges. The year-four sampling event was conducted in April 2003 and represents the sixth time the site has been sampled after completion of remedial activities in March 1999. The objective of the year-four sampling event was to collect data on the chemical characteristics of the backfill material four years after placement and compare those data to baseline and previous monitoring years' chemical conditions. Included in this report are a project background, descriptions of sampling and analytical methodologies, analytical results, and a quality assurance review of the analytical data. Figures and tables referenced in this report are located at the end of the narrative.

1.1 Project Background

Sediment remediation at the Norfolk CSO site was undertaken to partially fulfill requirements of a 1991 Consent Decree, which defined the terms of a natural resources damage agreement between King County (along with the City of Seattle) and federal, state, and tribal natural resources trustees. The Norfolk CSO site was chosen by the Elliott Bay/Duwamish Restoration Program (EB/DRP) Panel as one of four sites prioritized for potential sediment remediation.

A site characterization and cleanup study was performed in 1994 and 1995, and the cleanup study report was issued in 1996 (EB/DRP, 1996). Chemicals of concern at the site included mercury, 1,4-dichlorobenzene, bis(2-ethylhexyl) phthalate, and polychlorinated biphenyls (PCBs), all present at concentrations exceeding State of Washington Sediment Management Standards (SMS) sediment chemical criteria values that define cleanup screening levels. PCB "hot spot" concentrations at the site also exceeded Toxic Substances Control Act (TSCA) limits for hazardous waste disposal.

Site remediation began in early February 1999 and was completed by late March 1999. Remedial activities consisted of dredging and disposal of contaminated sediment and backfilling the dredged area to original grade with clean sediment from the Duwamish River Turning Basin. Contaminated sediments were removed from the site by mechanical dredge and dewatered on shore in a containment area first arranged to segregate batches about 50 cubic yards (cy) in size and later reconfigured to handle larger batches.

Sediment samples were collected daily from each 50-cy batch and analyzed for PCBs to determine the appropriate disposal destination. Sediments with a PCB concentration greater than 45 parts per million (ppm) were transported to a Subtitle C landfill in Arlington, Oregon for disposal. Sediments with a PCB concentration less than 45 ppm were transported to a Subtitle D landfill in Bremerton, Washington for disposal. A total of 5,190 cy of sediment was removed during the remediation, of which approximately 1,900 cy were transported to the Subtitle C landfill as hazardous waste. Sediment was generally removed to a depth of three feet, however, remediation in the PCB hot spot areas required removal of sediment up to a depth of nine feet. Confirmational testing, subsequent to dredging activities, indicated that, in some of the deepest-dredged areas, sediments were left in place that contained PCB

concentrations greater than SMS chemical criteria. Discussions with project oversight personnel from the EB/DRP Panel and State of Washington Department of Ecology (Ecology) determined that, at a depth of nine feet below original grade, these PCB-contaminated sediments could be left in place.

Clean backfill sediment was obtained from the Duwamish River Turning Basin during normal maintenance dredging operations by the Army Corps of Engineers (ACOE). Data collected by the Corps prior to maintenance dredging indicated that this material was suitable for use as backfill material (ACOE unpublished data, 1998). A sample was also collected from the Turning Basin sediment after it was placed on a barge and just prior to backfilling activities. Analytical results from this sample confirmed the suitability of the sediment as backfill material (King County unpublished data, 1999). No organic chemicals were detected in the sample and metals were detected at levels indicative of natural, area-wide crustal sediment concentrations. Approximately 6,700 cy of Turning Basin sediment were used to backfill the dredged area at the Norfolk CSO sediment remediation site. A site closure report was issued in August 1999 (EBDRP, 1999).

The site hydraulic permit, issued by the Washington State Department of Fish and Wildlife prior to remediation, requires that the site be monitored for a period of five years following remedial activities to evaluate possible recontamination of the backfill sediment as a result of continuing CSO or storm water discharges. To comply with this permit, a five-year monitoring plan was prepared that includes sampling and analysis of surficial sediments from four stations in the backfilled area. Resulting analytical data allows King County to evaluate the chemical characteristics of the sediment and assess possible recontamination over time. Monitoring activities are performed in accordance with a sampling and analysis plan addendum prepared by King County (King County, 1999).

1.2 Site Description

The Norfolk CSO sediment remediation site is located in the Duwamish River, above the Turning Basin, at approximately river kilometer 10 in the City of Tukwila (Figure 1). The site is located upstream of the river reach maintained for commercial navigation and, as such, has maintained its natural channel as well as some riparian habitat (EBDRP, 1996). The shoreline is characterized by a steeply-sloping, erosional bank maintained with large concrete riprap. The bank joins a gently-sloping, intertidal mud shoreline that is completely exposed during extreme low tides.

The Norfolk CSO outfall originates at King County's Norfolk Street Regulator Station near South 102nd Street and East Marginal Way in Tukwila (EBDRP, 1996). The outfall structure has a flap gate over the 84-inch discharge pipe and a concrete splash plate that is exposed during normal low tides. The remediation site is located adjacent to the outfall structure and is characterized by exposed, intertidal mud habitat as well as subtidal riverbed. The intertidal zone has been channelized, both by the discharge of the Norfolk CSO and by a storm drain that drains a Boeing Company parking lot adjacent to the CSO outfall.

2 SAMPLE COLLECTION

This section describes sampling activities conducted in April 2003. All sampling activities were conducted following guidance suggested in the Puget Sound Protocols (PSEP, 1997a and 1998).

2.1 Sample Locations and Station Positioning

Four sediment sampling locations were established for annual monitoring and were assigned corresponding state plane coordinates (NAD83) specific to each station. These four sampling locations were selected prior to the October 1999 six-month sampling event (King County, 2000) and were designed to assess potential recontamination at the site and evaluate the chemical characteristics of the backfill material at the following locations:

- within the Norfolk CSO channel, prior to its confluence with the Boeing storm drain (SD) channel (station NFK501);
- on the delta after the confluence of the Norfolk CSO and Boeing SD channels (station NFK502);
- within the Boeing SD channel prior to its confluence with the Norfolk CSO channel (station NFK503); and
- upriver of both the Norfolk CSO and Boeing SD channels (station NFK504).

Station locations were selected to monitor sediment quality in those areas with the greatest potential for recontamination; one station in the Norfolk CSO channel, one station in the Boeing SD channel, and one station on the delta formed after the confluence of the CSO and SD channels. The upriver station was selected to provide background or reference data.

The prescribed station coordinates are presented in Table 1 and station locations are shown in Figure 2.

Sediment grab samples were collected from the King County research vessel *Chinook*, which is equipped with a differential global positioning system (DGPS). The DGPS is a satellite-based navigation system that operates using a receiver to calculate ground position by triangulating data transmitted by a constellation of satellites operated by the Department of Defense (DOD). The ship-board "differential" receiver receives both the DOD signal and signals originating from base stations operated by various agencies including the Coast Guard and King County. System software applies a differential correction and calculates a precise, real-time navigational position.

Representative samples were collected at each station by compositing sediment from multiple grabs into single samples for both the 0 to 2 centimeter (cm) and 0 to 10 cm depth strata. Coordinates, shown in Table 1, were recorded using DGPS for each individual sediment grab as the sampler contacted the river bottom. All sediment samples from stations NFK501, NFK502, and NFK503 were collected by compositing sediment from three separate deployments of the grab sampler. Due to an oversight, both samples collected from station NFK504 were composited from only two deployments of the grab sampler.

2.2 Sample Collection and Handling

Four 0 to 2 cm and four 0 to 10 cm depth stratum sediment samples were collected April 23, 2003 from the four routine monitoring stations at the Norfolk CSO sediment remediation site. Water depth at the four sampling stations ranged from 2 to 4 meters (~ 6.5 to 13 feet) on a slack to ebbing tide between +8 and +6.5 feet (referenced to mean lower low water). Samples were collected using a stainless steel, modified, 0.1 m^2 van Veen grab sampler deployed from the *Chinook*. Samples at stations NFK501, NFK502, and NFK503 were composited from three separate deployments of the grab sampler and samples at station NFK504 were composited from two deployments. Between 11 and 14 cm of sediment was recovered in each grab, allowing collection of a sample aliquot from the top 10 cm without sampling sediment that had touched the sides or bottom of the grab sampler.

Sediment aliquots from the 0 to 2 cm depth stratum were collected from one side of each grab using a 200 cm^3 stainless-steel "cookie cutter." Sediment aliquots from the 0 to 10 cm depth stratum were collected from the other side of each grab using a stainless-steel spoon. Each of the aliquots was placed into separate stainless-steel bowls, covered with foil, and placed into an ice-filled cooler between grab deployments. After collecting aliquots from two or three grabs per station, the sediment sample was thoroughly homogenized and then split out into pre-labeled containers. Sample containers were supplied by the King County Environmental Laboratory and were pre-cleaned according to analytical specifications.

Two sets of sample compositing equipment were dedicated to each station, precluding the need for decontamination of this field gear. The Van Veen grab sampler was decontaminated between stations by scrubbing with a brush and river water followed by a thorough *in situ* rinsing.

Samples were stored in ice-filled coolers from the time of collection until delivery to the King County Environmental Laboratory. Samples were delivered under chain-of-custody and were maintained as such throughout the analytical process. Samples were stored frozen (-18°C) until analysis with the exception of samples for particle size distribution (PSD) analysis. PSD samples were stored refrigerated at approximately 4°C. All analyses were conducted by the King County Environmental Laboratory with the exception of PSD, which was analyzed at AmTest, Inc., a contracted laboratory accredited by Ecology.

3 SAMPLE ANALYSIS

Eight estuarine sediment samples collected April 23, 2003 were submitted for analysis of conventional, metal, and organic parameters. This section describes the types of analysis performed, as well as analytical methodologies used and the associated quality assurance/quality control (QA/QC) procedures followed. Analyses were selected to allow comparison of sediment data to the SMS sediment chemical criteria found in Tables 1 and 3 of Chapter 173-204 WAC (Ecology, 1995).

3.1 Conventionals

Conventional analyses included percent solids, total organic carbon (TOC), and PSD. Percent solids and TOC analyses were performed to provide data necessary to normalize sediment data to dry weight and organic carbon, respectively. TOC analysis also allows evaluation of possible organic enrichment at the site over time. Percent solids analysis was performed following SM 2540-G, gravimetric determination, and TOC analysis was performed following EPA Method 9060, high-temperature combustion with infrared spectroscopy. PSD analysis allows evaluation of the gross physical characteristics of the backfill material and any changes imparted by sedimentation or scouring. PSD analysis was performed according to method ASTM D422, a combination of sieve and hydrometer analyses.

3.2 Metals

Metal analyses included 12 priority pollutant metals, as well as the crustal metals aluminum, iron, and manganese. Metal analysis allows assessment of potential recontamination at the site over time. SMS provides regulatory chemical criteria for eight of the metals included in this suite of analytes; arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc. With the exception of mercury, all metal analyses were performed following EPA Method 3050A/6010B; strong-acid digestion with inductively coupled plasma optical emission spectroscopy (ICP-OES). Mercury was analyzed according to EPA Method 245.5, cold vapor atomic absorption spectroscopy (CVAA).

3.3 Organics

Organic analyses included base/neutral/acid extractable semivolatile compounds (BNAs) and PCBs. Organic analysis also allows assessment of potential recontamination at the site over time, especially by PCBs and phthalates. BNA analysis was performed following EPA Method 3550B/8270C (SW-846 [EPA, 1995]), gas chromatography with mass spectroscopy (GC/MS). PCBs were analyzed by EPA Method 8081A/8082 (SW-846), gas chromatography with electron capture detection (GC/ECD). This suite of analytes includes all organic compounds regulated under SMS.

3.4 Quality Assurance/Quality Control (QA/QC)

All analyses were performed following guidance recommended under the Puget Sound Protocols (PSEP 1986, 1997b, and 1997c) including associated QA/QC practices. Laboratory QA/QC practices produced data of sufficient quality to pass QA1 review. Analytical data were reviewed following QA1 guidelines (Ecology, 1989) and flagged with data qualifiers where appropriate. A comprehensive report of analytical data, including qualifier flags is included as Appendix A. The QA1 review narrative is included as Appendix B.

4 ANALYTICAL RESULTS

This section discusses analytical results and compares the data to sediment criteria specified under SMS (Ecology, 1995). Tables 2 through 10 referenced in this section summarize pertinent analytical data; comprehensive analytical data are located in Appendix A. Metals and organics data have been compared to both Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL) in Tables 4 through 7. Analytical data for this sampling event have also been compared to previous sampling events in Tables 8 and 9.

4.1 Particle Size Distribution (PSD)

PSD results are summarized in Table 2. The ratio of percent fine material (silt and clay) to percent coarse material (sand and gravel) was highest at the Boeing SD channel station (NFK503) in the 0 to 2 cm sample (58.7:41.1%) and was lowest at the upriver reference station (NFK504) in the 0 to 10 cm sample (2.5:97.4%).

Percent fine material decreased dramatically (16 and 26%) at the upriver reference station between the 2002 and 2003 sampling events (Tables 8 and 9), possibly indicating a significant movement of bedload due to deposition of coarser material or an area of increased scouring. Percent fine material decreased slightly at the Norfolk CSO channel station (NFK501) and Boeing SD channel station (NFK503) and increased slightly at the combined channel delta station (NFK502). These slight decreases and increase were all in the range of approximately 5 to 10%.

4.2 Conventionals

Conventional analytical results are summarized in Table 3 and include percent solids, used to calculate dry-weight sediment concentrations of metal and organic data and TOC, used to normalize certain organic parameters to organic carbon content.

Percent solids results range from 43.7 to 90.5%. TOC concentrations in the 0 to 2 cm depth stratum samples range from 1,690 to 29,300 milligrams per kilogram, normalized to dry weight (mg/Kg DW) or ~ 0.2 to 2.9%. TOC concentrations in the 0 to 10 cm depth stratum samples range from 1,100 to 24,300 mg/Kg DW, or ~ 0.1 to 2.4%.

TOC concentrations in samples collected from both depth strata at the Norfolk CSO channel station (NFK501), Boeing SD channel station (NFK503), and combined channel delta station (NFK502) remained relatively stable between the 2002 and 2003 sampling events (Tables 8 and 9). TOC concentrations at the upriver reference station (NFK504) decreased dramatically (by 8,500 to 12,000 mg/Kg DW or approximately 1%) between the 2002 and 2003 sampling events, corresponding with the decrease in percent fine material.

4.3 Metals

Metals analytical results are summarized in Table 4. Metals data have been normalized to dry weight for comparison to SMS chemical criteria. Silver was not detected in any samples collected during this sampling event. Reported concentrations of all other metals (Appendix A) are at levels indicative of natural, area-wide crustal concentrations (Dexter et al, 1981),

with the exception of the lead concentration detected in the sample collected from the 0 to 2 cm depth stratum at the Norfolk CSO channel station (NFK501). The reported lead concentration of 222 mg/Kg DW reported in this sample is significantly higher than in previous sampling events. This lead concentration, however, is still less than 50% of the SQS chemical criterion of 450 mg/Kg DW. All other metal concentrations or method detection limit (MDL) values for those metals regulated under SMS are below SQS chemical criteria.

4.4 Organics

Organic analytical results are summarized in Tables 5, 6, and 7. Data for ionic organic compounds have been normalized to dry weight for comparison to SMS chemical criteria and are presented in Table 5.

Data for non-ionic organic compounds have been normalized to organic carbon and are presented in Table 6 for comparison to SQS and CSL chemical criteria. Normalization to organic carbon can produce biased results, however, when the organic carbon content of the sample is very low (Ecology, 1992). When the organic carbon content of a sample is near 0.1 or 0.2% (1,000 to 2,000 mg/Kg DW), even background concentrations of certain organic compounds can exceed the SQS or CSL. The combined channel delta station (NFK502) had an organic carbon concentration between 0.17 and 0.26% and the upriver reference station (NFK504) had an organic carbon content between 0.11 and 0.23%. Although data for both of these stations are presented in Table 6 for comparison purposes, Table 6 information should be considered a summary of analytical results only for the Norfolk CSO channel station (NFK501) and the Boeing SD channel station (NFK503).

For sediment with a TOC content less than 0.5% (5,000 mg/Kg dry weight), Ecology recommends comparing dry weight-normalized, non-ionic organic data to Puget Sound lowest apparent effects thresholds (LAET) and second lowest apparent lowest effects thresholds (2LAET) (EPA, 1988), which are considered to be equivalent to the SQS and CSL values, respectively. This comparison allows a more appropriate evaluation of sediment quality relative to organic compounds (Ecology, 1992). Table 7 presents dry weight-normalized data and should be considered the appropriate data summary for the combined channel delta station (NFK502) and the upriver reference station (NFK504). Data from the other two stations are presented in Table 7 for comparative purposes.

The quality assurance narrative (Appendix B) states that analytical results for three organic compounds were impacted by laboratory contamination, indicated by detectable concentrations in the laboratory method blank. Table 10 compares sample analytical results for benzyl butyl phthalate, bis(2-ethylhexyl) phthalate, and di-N-butyl phthalate, on which various data analyses have been performed to evaluate the impact of laboratory contamination. Table 10 compares analytical results for these three compounds using the following five methods of adjusting sample results to account for method blank contamination:

- sample concentration reported with no adjustment for the method blank concentration;
- sample concentration reported with the method blank concentration subtracted from the dry weight sample result after normalization to dry weight;

- sample concentration reported with the method blank concentration subtracted from the wet weight sample result prior to normalization to dry weight (because the method blank is anhydrous sodium sulfate, it is considered to be 100% solids and the wet weight and dry weight values for any compound are the same);
- sample concentration reported with its associated dry weight MDL raised to five times the method blank concentration; and
- sample concentration reported with its associated dry weight MDL raised to ten times the method blank concentration.

4.4.1 Ionic Organic Compounds

Benzoic acid was detected in all eight samples at concentrations ranging from 38 to 563 micrograms per kilogram normalized to dry weight (µg/Kg DW). The benzoic acid concentration of 563 µg/Kg DW detected in the sample collected from the 0 to 2 cm depth stratum at the Norfolk CSO channel station is significantly higher than previous sampling events (Table 9). This concentration, however, it is still below the SQS/CSL criterion of 650 µg/Kg DW and represents 87% of the SQS/CSL value.

Phenol and 4-methylphenol were detected for the first time during the April 2003 sampling event. Phenol was detected at concentrations of 75.7 and 28 µg/Kg DW, respectively, in the samples collected from the 0 to 2 cm and 0 to 10 cm depth strata at the Norfolk CSO channel station. Phenol was detected at a concentration of 33 µg/KG DW in the sample collected from the 0 to 2 cm depth stratum at the Boeing SD channel station. These reported phenol concentrations are below the SQS chemical criterion of 420 µg/Kg DW. 4-Methylphenol was detected at a concentration of 55 µg/Kg in the sample collected from the 0 to 10 cm depth stratum at the Norfolk CSO channel station and at a concentration of 112 µg/Kg DW in the sample collected from the 0 to 2 cm depth stratum at the Boeing SD channel station. Both of these reported 4-methylphenol concentrations are below the SQS/CSL chemical criterion of 670 µg/Kg DW.

Dry weight-normalized method detection limits for the non-ionic organic compounds met SQS/CSL chemical criteria for all samples collected during this sampling event.

4.4.2 Non-Ionic Organic Compounds Compared to SQS/CSL Criteria

Organic carbon concentrations in samples collected during this sampling event from the Norfolk CSO channel station and the Boeing SD channel station range from ~2.2 to 2.9%. This section discusses organic analytical results for these two stations (NFK501 and NFK503) since the data can appropriately be normalized to organic carbon for comparison SQS and CSL chemical criteria. Analytical results for the combined channel delta station (NFK502) and the upriver reference station (NFK504) will be discussed in Section 4.4.3 because the organic carbon values of ~0.1 to 0.3% justify comparison of dry weight-normalized data from these two stations to LAET and 2LAET chemical criteria (Ecology, 1992), which are equivalent to SQS and CSL criteria.

4.4.2.1 Low-Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs)
Anthracene and phenanthrene were detected in all four samples collected from the Norfolk CSO channel and Boeing SD channel stations. Organic carbon-normalized anthracene concentrations range from 0.51 to 0.771 milligrams per kilogram organic carbon (mg/Kg OC), all less than 0.4% of the SQS chemical criterion of 220 mg/Kg OC. Organic carbon-normalized phenanthrene concentrations range from 3.73 to 6.45 mg/Kg OC, all less than 7% of the SQS chemical criterion of 100 mg/Kg OC. Acenaphthene was detected in the two samples collected from the Norfolk CSO channel station at concentrations of 0.78 and 0.68 mg/Kg OC, both less than 5% of the SQS chemical criterion of 16 mg/Kg OC. The range of total LPAH concentrations, from 4.2 to 8.0 mg/Kg OC, is less than 3% of the SQS chemical criterion of 370 mg/Kg OC

4.4.2.2 High-Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs)
All nine HPAH compounds were detected in all four samples collected from the Norfolk CSO channel and Boeing SD channel stations. All reported HPAH concentrations are less than their respective SQS chemical criteria and the range of total HPAH concentrations, from 38 to 62.7 mg/Kg OC, is less than 7% of the SQS chemical criterion of 960 mg/Kg OC. No individual reported HPAH concentration is greater than 15% of its associated SQS chemical criterion.

4.4.2.3 Chlorobenzenes
1,4-Dichlorobenzene was detected in all four samples collected from the Norfolk CSO channel and Boeing SD channel stations at concentrations ranging from 0.0761 to 0.305 mg/Kg OC. These reported concentrations are all less than 10% of the 1,4-dichlorobenzene SQS chemical criterion of 3.1 mg/Kg OC.

Hexachlorobenzene was detected at a concentration of 0.10 mg/Kg OC in the sample collected from the 0 to 10 cm depth stratum at the Boeing SD channel station (NFK503). This reported concentration is less than the hexachlorobenzene SQS chemical criterion of 0.38 mg/Kg OC.

4.4.2.4 Phthalates
Three phthalates were detected in all four samples collected from the Norfolk CSO channel and Boeing SD channel stations; benzyl butyl phthalate, bis(2-ethylhexyl) phthalate, and di-N-butyl phthalate.

Benzyl butyl phthalate was detected at concentrations ranging from 1.53 to 2.52 mg/Kg OC, all less than the SQS chemical criterion of 4.9 mg/Kg OC. This compound, however, was detected in the quality control method blank. Benzyl butyl phthalate concentrations in all four samples are less than either five or ten times the method blank concentration and, as such, should be considered compromised by laboratory contamination. Section 4.4.4.1 and Table 10 provide an evaluation of the impact to sample results from laboratory contamination.

Bis(2-ethylhexyl) phthalate was detected at concentrations ranging from 22.1 to 33.0 mg/Kg OC, all less than the SQS chemical criterion of 47 mg/Kg OC. Although this compound was also detected in the quality control method blank, these sample concentrations are all greater than ten times the method blank concentration and the large sample-concentration to method-

blank concentration ratio indicates that the results should be considered valid as reported. The reported bis(2-ethylhexyl) phthalate concentrations range from 54 to 70% of the SQS chemical criterion.

Di-N-butyl phthalate was detected at concentrations ranging from 1.12 to 1.28 mg/Kg OC, all less than the SQS chemical criterion of 220 mg/Kg OC. This compound was also detected in the quality control method blank and all sample concentrations are less than five times the method blank concentration. As a result, di-N-butyl phthalate sample results should be considered compromised by laboratory contamination.

Di-N-octyl phthalate was detected in one sample, collected from the 0 to 2 cm depth stratum at the Norfolk CSO channel station (NFK501), at a concentration of 4.98 mg/Kg OC. This reported di-N-octyl phthalate concentration is less than 12% of the SQS chemical criterion of 58 mg/Kg OC.

Due to problems with laboratory contamination, it is difficult to compare phthalate concentrations over time and these compounds have not been included in Tables 8 and 9.

4.4.2.5 Miscellaneous Compounds

Dibenzofuran, hexachlorobutadiene, and N-nitrosodiphenylamine were not detected in any samples collected during this sampling event from the Norfolk CSO channel and Boeing SD channel stations. MDL values for these compounds meet all associated SQS chemical criteria when sample data are normalized to organic carbon.

4.4.2.6 PCBs

PCBs (as total Aroclors®) were detected in all four samples collected during this sampling event from the Norfolk CSO channel and Boeing SD channel stations. Reported total PCB concentrations in samples collected from the 0 to 2 cm and 0 to 10 cm depth strata at the Norfolk CSO channel station (NFK501) were 4.28 and 4.06 mg/Kg OC, respectively. Reported total PCB concentrations in samples collected from the 0 to 2 cm and 0 to 10 cm depth strata at the Boeing SD channel station (NFK503) were 4.13 and 7.93 mg/Kg OC, respectively. These reported total PCB concentrations all meet the SQS chemical criterion of 12 mg/Kg OC.

4.4.3 Non-Ionic Organic Compounds Compared to LAET/2LAET Criteria

Due to the low organic carbon content (~0.1 to 0.3%) of samples collected from the combined channel delta station (NFK502) and the upriver reference station (NFK504), it is inappropriate to organic carbon-normalize the non-ionic organic data. Table 7 compares dry weight-normalized data for this station to LAET and 2LAET chemical criteria as well as presenting dry weight-normalized data for the other two stations for comparative purposes.

4.4.3.1 Low-Molecular Weight Polynuclear Aromatic Hydrocarbons (LPAHs)

Phenanthrene was the only LPAH compound detected in samples collected from the combined channel delta and upriver reference stations and was detected in all four samples. Reported phenanthrene concentrations range from 5.5 to 30.1 µg/Kg DW, all less than 2% of the LAET chemical criterion of 1,500 µg/Kg DW. This same concentration range, as total LPAHs, is less than 0.6% of the LAET chemical criterion of 5,200 µg/Kg DW.

4.4.3.2 High-Molecular Weight Polynuclear Aromatic Hydrocarbons (HPAHs)
Seven of nine HPAH compounds were detected in one or more samples collected from the combined channel delta and upriver reference stations. No individual HPAH concentration was greater than 3% of its associated LAET chemical criterion and the range of total HPAH concentrations, 68 to 200 µg/Kg DW, are all less than 2% of the LAET chemical criterion of 12,000 µg/Kg DW.

4.4.3.3 Chlorobenzenes
1,4-Dichlorobenzene was detected in both samples collected from the combined channel delta station (NFK502) at concentrations of 0.530 and 0.549 µg/Kg DW, both less than 0.5% of the LAET chemical criterion of 110 µg/Kg DW. 1,4-Dichlorobenzene was not detected in either sample collected from the upriver reference station (NFK504) and no other chlorobenzene compounds were detected at either station.

4.4.3.4 Phthalates
Three phthalates were detected in samples collected from the combined channel delta and upriver reference stations. Benzyl butyl phthalate was detected in three of four samples at concentrations ranging from 11 to 19.7 µg/Kg DW, compared to the LAET chemical criterion of 63 µg/Kg DW. Bis(2-ethylhexyl) phthalate was detected in all four samples at concentrations ranging from 19.9 to 60.6 µg/Kg DW, compared to the LAET chemical criterion of 1,300 µg/Kg DW. Di-N-butyl phthalate was detected in all four samples at concentrations ranging from 9.3 to 12.1 µg/Kg DW, compared to the LAET chemical criterion of 1,400 µg/Kg DW.

All reported phthalate concentrations are less than five times the respective concentrations detected in associated laboratory method blanks. As such, all reported phthalate concentrations for samples collected from the combined channel delta station (NFK502) and the upriver reference station (NFK504) should be considered compromised by laboratory contamination (see Section 4.4.4).

4.4.3.5 Miscellaneous Compounds
Dibenzofuran, hexachlorobutadiene, and N-nitrosodiphenylamine were not detected in any samples collected during this sampling event from the combined channel delta and upriver reference stations. Dry weight-normalized MDL values for these compounds meet all associated LAET chemical criteria.

4.4.3.6 PCBs
PCBs were detected at a concentration of 21.0 µg/Kg DW in the sample collected from the 0 to 10 cm depth stratum at the combined channel delta station (NFK502). This reported total PCB concentration is less than 17% of the LAET chemical criterion of 130 µg/Kg DW. PCBs were not detected in the sample collected from the 0 to 2 cm depth stratum at the combined channel delta station or in either sample collected from the upriver reference station (NFK504). The dry weight-normalized MDL for PCBs for these samples ranged from 2.4 to 4.7 µg/Kg DW.

4.4.4 Evaluation of Laboratory Contamination on Sample Results

The quality assurance review for this sampling event (Appendix B) indicates that laboratory contamination impacted sample results for three compounds; benzyl butyl phthalate, bis(2-ethylhexyl) phthalate, and di-N-butyl phthalate. Detectable concentrations of these three compounds were reported in the quality control method blank. Table 10 summarizes the evaluation of impacts these method blank results have had on sample results.

4.4.4.1 Benzyl Butyl Phthalate

Benzyl butyl phthalate was detected in the quality control method blank at a concentration of 9.2 µg/Kg. This concentration may be considered either a wet weight or dry weight concentration because the method blank matrix (anhydrous sodium sulfate) is considered to be 100% solids.

Benzyl butyl phthalate was detected in seven of eight samples collected during this sampling event at concentrations ranging from 11 to 73.9 µg/Kg DW. The MDL values for the sample in which this compound was not detected was 7.1 µg/Kg DW. Subtracting the method blank concentration from the detected dry weight-normalized or wet weight sample concentrations provides lower results for five of the seven samples and changes results for the other two samples to less than the MDL.

Environmental Protection Agency (EPA) data validation guidance (EPA, 1991) recommends raising the MDL by either five or ten times the method blank concentration for common laboratory contaminants such as phthalates. Raising the MDL for butyl benzyl phthalate to 46 µg/Kg DW (five times the method blank concentration) changes five of the seven detected sample results to less than the MDL. Raising the MDL to 92 µg/Kg DW (10 times the method blank concentration) changes all benzyl butyl phthalate sample results to less than the MDL. The dry weight-normalized MDL of 46 µg/Kg DW (applicable to the combined channel delta and upriver reference samples) meets the LAET chemical criterion of 63 µg/Kg DW. The resulting organic carbon-normalized MDL values for the samples collected from the Norfolk CSO channel and Boeing SD channel stations (3.1 to 4.2 mg/Kg OC) meet the SQS chemical criterion of 4.9 mg/Kg OC.

Based on this evaluation, it appears that all benzyl butyl phthalate sample results have been compromised by laboratory contamination and should be considered as "less than the MDL."

4.4.4.2 Bis(2-ethylhexyl) Phthalate

Bis(2-ethylhexyl) phthalate was detected in the quality control method blank at a concentration of 27.7 µg/Kg. This compound was detected in all eight samples collected during this sampling event at concentrations ranging from 19.9 to 968 µg/Kg DW.

Subtracting the method blank concentration from either dry weight-normalized or wet weight bis(2-ethylhexyl) phthalate sample results does not significantly lower reported concentrations for four of eight samples. Bis(2-ethylhexyl) phthalate results for both samples collected from the combined channel delta station (NFK502), however, are lowered by greater than 50% and results for both samples collected from the upriver reference station (NFK504) become less than the MDL.

Raising the MDL to 140 µg/Kg DW (five times the method blank concentration) changes results for both samples collected from the combined channel delta station (NFK502) to less than the MDL. The resulting MDL value of 140 µg/Kg DW meets the LAET chemical criterion of 1,300 µg/Kg DW. Bis(2-ethylhexyl) phthalate results from the Norfolk CSO channel (NFK501) and Boeing SD channel (NFK503) stations are all greater than ten times the method blank concentration and may be considered valid as reported.

Based on this evaluation, it appears that bis(2-ethylhexyl) sample results from the combined channel delta station (NFK502) and the upriver reference station (NFK504) have been compromised by laboratory contamination and should be considered as "less than the MDL."

4.4.4.3 Di-N-butyl Phthalate

Di-n-butyl phthalate was detected in the quality control method blank at a concentration of 9.0 µg/Kg. This compound was detected in all eight samples collected during this sampling event at concentrations ranging from 9.3 to 35.2 µg/Kg DW.

Subtracting the method blank concentration from the dry weight-normalized sample concentrations provides lower results for four of the eight samples and changes the results for the other four samples to less than the MDL. Subtracting the method blank concentration from wet weight sample concentrations prior to dry weight-normalization again lowers the sample results and changes results for five of eight samples to less than the MDL.

Raising the MDL to 45 µg/Kg DW (five times the method blank concentration) changes results for all samples to less than the MDL. The resulting MDL values of 45 µg/Kg DW and 1.5 to 41 mg/Kg OC meet both the LAET and SQS chemical criteria of 1,400 µg/Kg DW and 220 mg/Kg OC, respectively.

Based on this evaluation, it appears that all di-N-butyl phthalate sample results have been compromised by laboratory contamination and should be considered as "less than the MDL."

5 FUTURE MONITORING

The April 2003 sampling event was year-four of the scheduled five-year monitoring program and the final sampling event will occur in April 2004. Station locations will remain the same unless the CSO and SD discharge channels change significantly over the course of the remaining monitoring period.

The final sampling event will again include collection of two discrete samples from each of the four established locations. One sample will be collected from the top 2 cm of sediment and analyzed to evaluate the chemical characteristics of recently deposited material. Another sample will be collected from the top 10 cm to evaluate the chemical characteristics of the sediment over the entire biologically-active zone, which is appropriate for comparison with SMS chemical criteria. Results of the five-year monitoring program will be reported to regulatory agencies and the rate of recontamination discussed to determine whether monitoring activities can be concluded.

6 SUMMARY AND CONCLUSIONS

Eight estuarine sediment samples were collected in April 2003 from the Norfolk CSO sediment remediation site, four years after completion of remedial activities. Samples were collected from the surface of backfill material placed at the site and analytical results were compared to baseline chemical conditions of the backfill material to evaluate possible recontamination. Samples were collected from two depth strata at each of four stations: one sample collected from the 0 to 2 cm depth stratum to evaluate chemical concentrations in recently deposited sediment; and one sample collected from the 0 to 10 cm depth stratum to evaluate sediment chemical concentrations over the entire biologically-active zone. Analytes included sediment conventionals along with metal and organic parameters regulated under SMS criteria. To allow comparison of analytical results from the six sampling events completed to date, dry weight-normalized data from 0 to 10 cm depth stratum samples from the April 1999, October 1999, April 2000, April 2001, April 2002, and April 2003 sampling events are presented in Table 8. These analytical results show that, after four years, conditions of the backfill material **in the 0 to 10 cm depth stratum** can be characterized by:

- little change, within the last monitoring year, in organic carbon content at the Norfolk CSO channel (NFK501) and the Boeing SD channel (NFK503) after a significant increase between the year-two (2001) and year-three (2002) sampling events;
- a mildly fluctuating organic carbon content at the combined channel delta station (NFK502) with all reported organic carbon concentrations between 0.1 and 0.5%;
- a sharp decrease, within the last monitoring year, in organic carbon content at the upriver reference station (NFK504) to a level of 0.1%, subsequent to gradually increasing organic carbon concentrations in past sampling events that peaked at 1.3% in year-three (2002);
- small changes in grain size distribution at the Norfolk CSO channel (NFK501), combined channel delta (NFK502), and Boeing SD channel (NFK503) stations, with slight decreases in fine materials at NFK501 and NFK503 and a slight increase in fine material at NFK502 over the last monitoring year;
- a sharp decrease, within the last monitoring year, in fine material at the upriver reference station (NFK504), which coincides with the decrease in organic carbon content and large decreases in concentrations of all metals except arsenic;
- very little change in metals concentrations at the combined channel delta station (NFK502);
- a steady, gradual increase in arsenic and lead concentrations at the Norfolk CSO channel station (NFK501) and Boeing SD channel station (NFK503) and a steady, gradual increase in chromium, copper, and zinc concentrations at the Boeing SD channel station, however, concentrations of these metals are still well-below all SMS chemical criteria;
- gradually increasing concentrations of most HPAH compounds and some LPAH compounds at the Norfolk CSO channel station (NFK501) and the Boeing SD channel station (NFK503), however, concentrations of these PAH compounds have remained relatively stable or decreased slightly over the last monitoring year and are still well-below all SMS chemical criteria;
- the presence of quantifiable concentrations of bis(2-ethylhexyl) phthalate at the Norfolk CSO channel (NFK501) and Boeing SD channel (NFK503) stations at concentrations ranging from 52 to 54% of the SQS; and

- a decrease in total PCB concentrations at all four stations to a level at which there are no exceedences of SQS or LAET chemical criteria.

A comparison of dry weight-normalized analytical results from the 0 to 2 cm depth stratum between the October 1999, April 2000, April 2001, April 2002, and April 2003 sampling events is presented in Table 9. These analytical results show that, after four years, conditions of the backfill material **in the 0 to 2 cm depth stratum** can be characterized by:

- little change, within the last monitoring year, in organic carbon content at the Norfolk CSO channel station (NFK501) and the Boeing SD channel station (NFK503) after a significant increase between the year-two (2001) and year-three (2002) sampling events;
- a mildly fluctuating organic carbon content at the combined channel delta station (NFK502) with all reported organic carbon concentrations between 0.1 and 0.8%;
- a sharp decrease, within the last monitoring year, in organic carbon content at the upriver reference station (NFK504) to a level of 0.2%, subsequent to gradually increasing organic carbon concentrations in past sampling events that peaked at 1.6% in year-two (2001);
- very little change, within the last monitoring year, in grain size distribution at the Norfolk CSO channel, combined channel delta, and Boeing SD channel stations;
- a sharp decrease, within the last monitoring year, in fine material at the upriver reference station (NFK504), which coincides with the decrease in organic carbon content and large decreases in the concentrations of all metals except arsenic;
- gradually increasing concentrations of arsenic, copper, mercury, and zinc at the Norfolk CSO channel station (NFK501) and gradually increasing concentrations of arsenic, chromium, copper, lead, and zinc at the Boeing SD channel station (NFK503), however, concentrations of all metals are still well below SMS chemical criteria;
- a sharp increase in the reported concentration of lead at the Norfolk CSO channel station (NFK501), however, the concentration of 222 mg/Kg DW is still less than 50% of the SQS and will need to be confirmed during the year-five (2004) sampling event.
- the presence of quantifiable concentrations of bis(2-ethylhexyl) phthalate at the Norfolk CSO channel (NFK501) and Boeing SD channel (NFK503) stations at concentrations ranging from 47 to 70% of the SQS; and
- a decrease in total PCB concentrations at all four stations to a level at which there are no exceedences of SQS or LAET chemical criteria.

Metals concentrations throughout the backfill material at the Norfolk sediment remediation site continue to be detected at concentrations close to regional background levels (Dexter et al, 1981), with the exception of the lead concentration of 222 mg/Kg DW detected in the sample collected from the 0 to 2 cm depth stratum at the Norfolk CSO channel station (NFK501). This lead concentration represents a marked increase over previous years' concentrations and appears to have been recently deposited. A source for this increase in lead has not been determined at this time. Concentrations of some metals (arsenic, copper, lead, and zinc) have doubled at the Norfolk CSO channel station (NFK501) and Boeing SD channel station (NFK503). These increasing metals concentrations appear to correspond with increasing levels of fine material and organic carbon that have accumulated over the past few monitoring years at both stations. All metals concentrations are below associated SQS chemical criteria in samples collected during the April 2003 sampling event.

While low levels of bis(2-ethylhexyl) phthalate have been detected in samples collected during previous sampling events, the concentrations have not been statistically different from concentrations detected in associated QC method blanks until the year-two (April 2001) sampling event (King County, 2001). Bis(2-ethylhexyl) phthalate concentrations detected during the April 2003 sampling event at the Norfolk CSO channel station (NFK501) and Boeing SD channel station (NFK503) were not significantly compromised by laboratory contamination. Bis(2-ethylhexyl) phthalate concentrations detected during the April 2003 sampling event at the Norfolk CSO channel and Boeing SD channel stations range between 47 and 70% of the SQS, which is a decrease from the results reported for the year-three (April 2002) sampling event. Conservative mathematical models predicted that bis(2-ethylhexyl) phthalate was a chemical of concern for recontamination, however, year-four sampling results show that concentrations are still less than the SQS chemical criterion and may be reaching a steady state. Positive sample results for two other phthalate compounds (benzyl butyl phthalate and di-N-butyl phthalate) have been compromised by laboratory contamination, based on method blank results, and should be considered as "less than the MDL."

Concentrations of most LPAH and HPAH compounds reported for the April 2003 sampling event are similar to those reported for the April 2002 sampling event at all stations. The highest concentration of PAH compounds are found at the Norfolk CSO channel station (NFK501) with somewhat lower values detected at the Boeing SD channel station (NFK503). Although PAH concentrations have increased near these outfalls, the highest total HPAH concentration of 62.7 mg/Kg OC at the Norfolk CSO channel station is less than 7% of the SQS. The similarity in results from the year-three (2002) and year-four (2003) sampling events could indicate that PAH concentrations are reaching a steady state.

Samples collected from three of four stations during the April 2003 sampling event have detected total PCB concentrations. PCBs were not detected in either sample collected from the upriver reference station (NFK504). All reported total PCB concentrations for the April 2003 sampling event are below the SQS, which is a significant decrease from concentrations detected during the April 2002 sampling event. The highest reported total PCB concentration for the April 2003 sampling event is 7.93 mg/Kg OC in the sample collected from the 0 to 10 cm depth stratum at the Boeing SD channel station (NFK503). This concentration is 66% of the SQS. This represents the first time in the last four monitoring years that PCB concentrations detected in the Boeing SD channel station have not exceeded the SQS or LAET.

Summary of Issues by Monitoring Station

<u>Norfolk CSO Channel (Station NFK501)</u>
Bis(2-ethylhexyl) phthalate concentrations detected in the 0 to 2 and 0 to 10 cm depth strata are 70 and 54% of the SQS, respectively. These concentrations are lower than those detected in the April 2002 sampling event (89 and 87% of the SQS). The reported concentrations of bis(2-ethylhexyl) phthalate for this station do not appear to be compromised by laboratory contamination. Phthalates are present in both CSO and separated storm water but the greatest potential for recontamination at the Norfolk cleanup site was predicted to be from separated storm water discharged from the Norfolk CSO outfall (EBDRP, 1996).

Concentrations may be reaching a steady state because there was no increase in concentrations between the year-three (2002) and year-four (2003) sampling events.

The 1,4-dichlorobenzene concentration detected in the 0 to 10 cm depth stratum is less than 10% of the SQS. This represents a decrease in 1,4-dichlorobenzene concentration at this station of about 42% from the concentration reported for the April 2002 sampling event (52% of the SQS).

The highest PAH concentrations were detected at this station but the total HPAH value is less than 7% of the SQS chemical criterion and concentrations may be reaching a steady state.

Total PCB concentrations detected in the 0 to 2 and 0 to 10 cm depth strata are 36 and 34% of the SQS, respectively. This represents a decrease in total PCB concentrations to about half of those detected during the April 2002 sampling event (61 and 68% of the SQS).

Some metals concentrations have doubled (arsenic, copper, lead, and zinc) but are well below SQS chemical criteria and appear to correspond with increased accumulation of fine materials and organic carbon. The reported lead concentration of 220 mg/Kg DW, detected in the sample collected from the 0 to 2 cm depth stratum, is a significant increase over previous sampling events (6.2 to 12 mg/Kg DW). This lead concentration, however, is still less than 50% of the SQS.

Combined Channel Delta (Station NFK502)
No chemicals of concern at this time. All reported phthalate concentrations for this station should be considered compromised by laboratory contamination, based on method blank results.

PCBs concentrations were elevated during monitoring year-one (2000) and year-two (2001) and corresponded to elevated PCB concentrations in the Boeing SD channel but, in monitoring year-three (2002), dropped to undetected. PCBs were not detected in the 0 to 2 cm sample in 2003 (year-four) but the 0 to 10 cm sample had a total PCB concentration of 21.0 μg/Kg DW, which is less than 17% of the SQS. Total PCB concentrations detected at this station during 2002 and 2003 have fluctuated in accordance with detected levels of organic carbon.

Boeing Storm Drain Channel (Station NFK503)
The bis(2-ethylhexyl) phthalate concentration in the 0 to 2 cm sample is 47% of the SQS and in the 0 to 10 cm sample is 52% of the SQS. These concentrations are lower than those reported for the April 2002 sampling event (92 and 86% of the SQS) and may indicate that concentrations are reaching a steady state. The reported concentrations of bis(2-ethylhexyl) phthalate for this station do not appear to be compromised by laboratory contamination.

This station has always had the highest reported PCB concentrations that steadily increased to a maximum value of 1,330 μg/Kg DW in monitoring year-two (2001). This station has shown a steady decrease, however, in year-three (2002) and year-four (2003). Results from the April 2003 sampling event show that the total PCB concentration in the 0 to 2 cm sample is 34% of the SQS and in the 0 to 10 cm sample is 66% of the SQS.

The Boeing Company conducted a cleanup of PCB-contaminated sediment in September 2003 inshore of the Norfolk sediment cap, directly in front of one of their storm drains. These sediments were previously identified by King County as a likely source of increased PCB concentrations observed at the Boeing SD channel station (King County 2001). Boeing's cleanup effort removed approximately 60 cy of contaminated sediment.

Upriver Reference (Station NFK504)

No chemicals of concern at this time. All reported phthalate concentrations for this station should be considered compromised by laboratory contamination, based on method blank results. PCBs were not detected in either sample collected from this station. This station showed a steady increase in fine material, organic carbon, and some metals until the year-four (2003) sampling event. Results from this sampling event showed a sharp drop in concentrations of all these constituents. This decrease suggests that the station was subjected to deposition or scouring from river currents.

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FIGURES

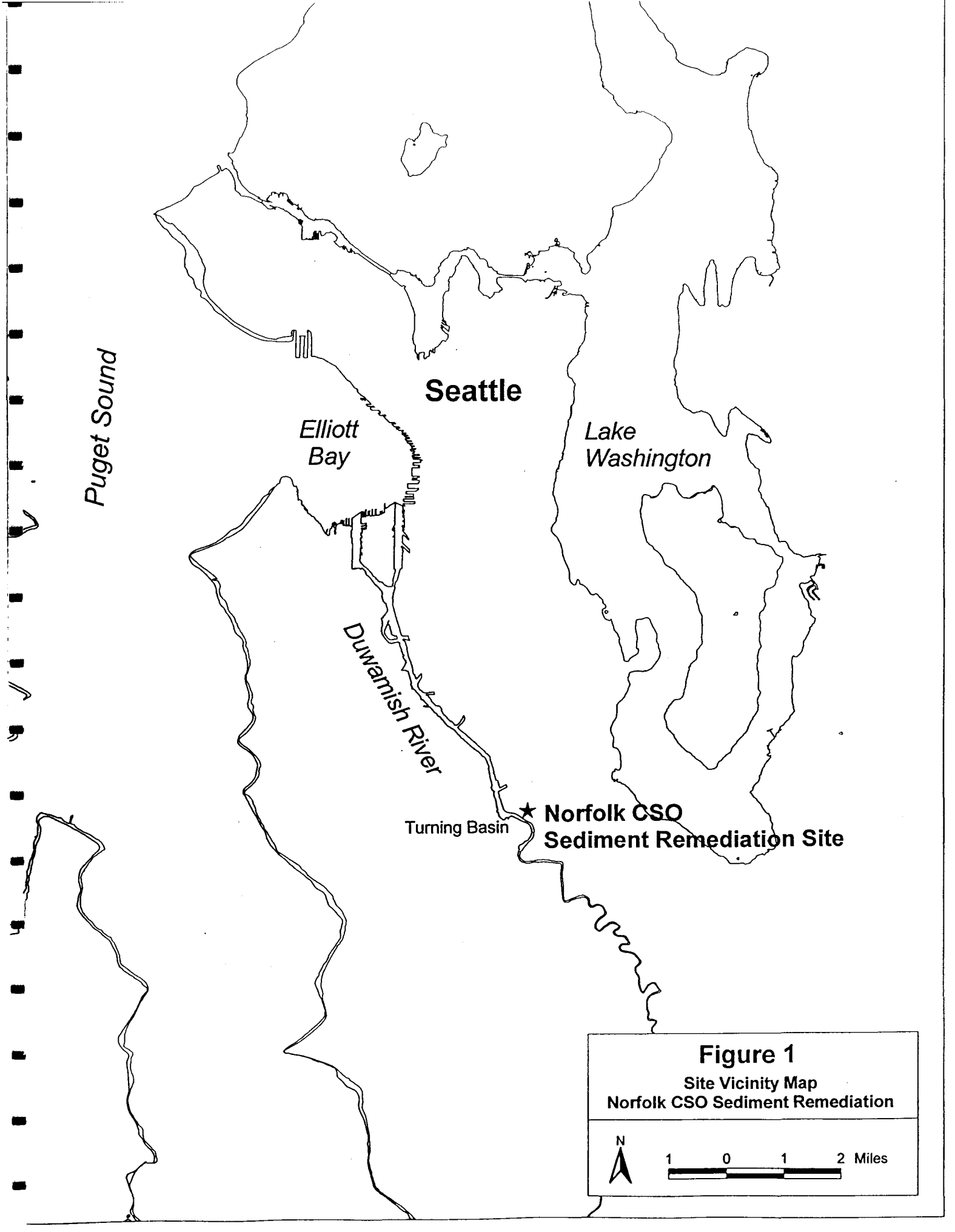

Figure 1
Site Vicinity Map
Norfolk CSO Sediment Remediation

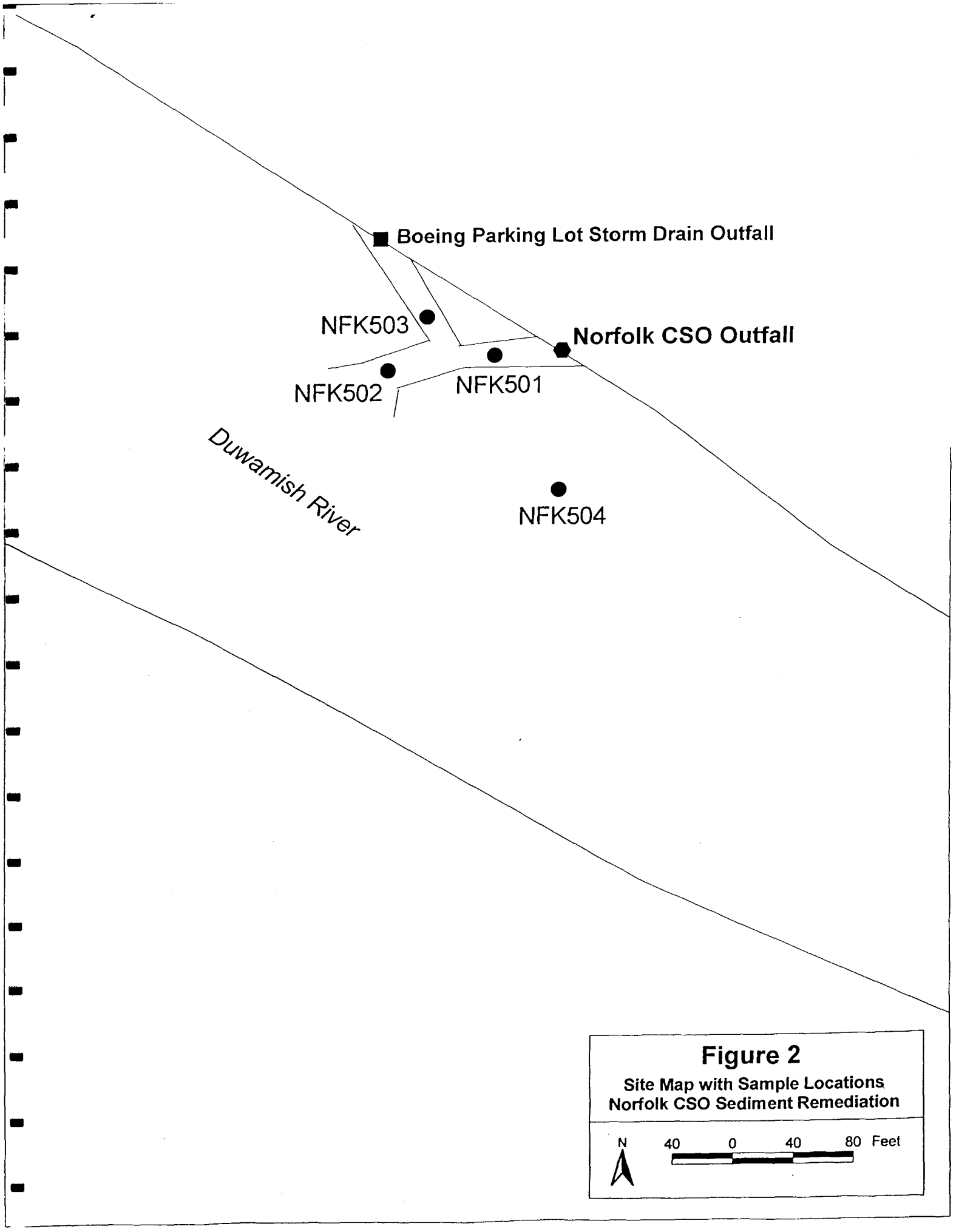

Figure 2

Site Map with Sample Locations
Norfolk CSO Sediment Remediation

TABLES

Table 1
Sample Location Coordinates
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Four, April 2003

Station Name	Northing (NAD83)		Easting (NAD83)	
NFK501 Prescribed Station	190170		1278584	
NFK501 Grab 1		190168		1278585
NFK501 Grab 2		190167		1278585
NFK501 Grab 3		190166		1278587
NFK502 Prescribed Station	190159		1278514	
NFK502 Grab 1		190161		1278512
NFK502 Grab 2		190153		1278513
NFK502 Grab 3		190155		1278509
NFK503 Prescribed Station	190195		1278544	
NFK503 Grab 1		190193		1278545
NFK503 Grab 2		190198		1278543
NFK503 Grab 3		190200		1278540
NFK504 Prescribed Station	190080		1278625	
NFK504 Grab 1		190076		1278622
NFK504 Grab 2		190076		1278622
NFK504 Grab 3		No Grab		No Grab

Notes

NAD83 - North American Datum, 1983

Table 2
Particle Size Distribution
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Four, April 2003

		Percent Distribution			
Phi Size	**Class**	**NFK 501 0 - 2 cm**	**NFK501 0 - 10 cm**	**NFK502 0 - 2 cm**	**NFK502 0 - 10 cm**
>p-2.00	Gravel	0.2	0.2	<MDL (0.1)	<MDL (0.1)
p-2.00	Gravel	0.2	0.2	0.1	0.2
p-1.00	Gravel	0.6	0.8	2.8	1.5
	Total Gravel	**1.0**	**1.2**	**2.9**	**1.7**
p0.00	Sand	2.1	2.6	26.4	16.6
p+1.00	Sand	22.2	23.2	50.2	50.3
p+2.00	Sand	18.1	35.7	14	23.7
p+3.00	Sand	2.1	3.1	0.8	0.9
p+4.00	Sand	11.9	5.2	0.6	0.3
	Total Sand	**56.4**	**69.8**	**92.0**	**91.8**
p+5.00	Silt	12.9	10.6	4.3	5.2
p+6.00	Silt	11	6	0.3	<MDL (0.1)
p+7.00	Silt	8.3	4.7	0.6	0.9
p+8.00	Silt	3.8	4	<MDL (0.1)	0.2
	Total Silt	**36.0**	**25.3**	**5.2**	**6.3**
p+9.00	Clay	1.8	1.0	<MDL (0.1)	<MDL (0.1)
p+10.00	Clay	1.1	0.4	<MDL (0.1)	<MDL (0.1)
<p+10.00	Clay	3.8	2.3	<MDL (0.1)	<MDL (0.1)
	Total Clay	**6.7**	**3.7**	**<MDL (0.1)**	**<MDL (0.1)**

		Percent Distribution			
Phi Size	**Class**	**NFK503 0 - 2 cm**	**NFK503 0 - 10 cm**	**NFK504 0 - 2 cm**	**NFK504 0 - 10 cm**
>p-2.00	Gravel	0.2	0.2	<MDL (0.1)	0.4
p-2.00	Gravel	0.4	0.4	<MDL (0.1)	0.2
p-1.00	Gravel	0.2	0.4	2.4	2.5
	Total Gravel	**0.8**	**1.0**	**2.4**	**3.1**
p0.00	Sand	0.8	0.8	21.8	14.5
p+1.00	Sand	1.6	4.7	41.0	41.1
p+2.00	Sand	1.6	8.8	24.2	35.3
p+3.00	Sand	7.8	18.0	4.8	2.8
p+4.00	Sand	28.5	22.7	1.7	0.6
	Total Sand	**40.3**	**55.0**	**93.5**	**94.3**
p+5.00	Silt	22.7	15.0	2.4	2.0
p+6.00	Silt	11.8	9.6	1.1	0.4
p+7.00	Silt	11.2	8.7	0.3	0.1
p+8.00	Silt	6.9	5.4	0.3	<MDL (0.1)
	Total Silt	**52.6**	**38.7**	**4.1**	**2.5**
p+9.00	Clay	1.7	2.6	<MDL (0.1)	<MDL (0.1)
p+10.00	Clay	0.5	1.5	<MDL (0.1)	<MDL (0.1)
<p+10.00	Clay	3.9	1.4	<MDL (0.1)	<MDL (0.1)
	Total Clay	**6.1**	**5.5**	**<MDL (0.1)**	**<MDL (0.1)**

Notes

<MDL (#) - Analyte not detected above the *method detection limit*. Value is parentheses is the numeric MDL.

Table 3
Sediment Conventional Results
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Four, April 2003

Conventionals	NFK 501 0 - 2 cm	NFK501 0 - 10 cm	NFK502 0 - 2 cm	NKF502 0 - 10 cm
Solids (%)	43.7	57.8	90.5	87.4
TOC (mg/Kg DW)	29,300	22,100	1,690	2,560

Conventionals	NFK503 0 - 2 cm	NFK503 0 - 10 cm	NFK504 0 - 2 cm	NFK504 0 - 10 cm
Solids (%)	48.6	51.8	84.5	84.8
TOC (mg/Kg DW)	27,600	24,300	2,280	1,100

Notes

TOC - Total organic carbon.

mg/Kg DW - Milligrams per kilogram dry weight, based on percent solids analysis.

Table 4
Sediment Metal Results
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Four, April 2003

	Concentration (mg/Kg DW)					
Metal	**NFK501 0 - 2 cm**	**NFK501 0 - 10 cm**	**NFK502 0 - 2 cm**	**NFK502 0 - 10 cm**	**SQS**	**CSL**
Arsenic	7.8	8.3	4.3	4.7	57	93
Cadmium	0.23	0.16	<MDL (0.15)	<MDL (0.17)	5.1	6.7
Chromium	18.0	14.1	15.1	12.1	260	270
Copper	30.9	23.7	13.7	13.3	390	390
Lead	222	13.0	3.5	4.2	450	530
Mercury	0.11	0.062	<MDL (0.022)	<MDL (0.023)	0.41	0.59
Silver	<MDL (0.21)	<MDL (0.17)	<MDL (0.21)	<MDL (0.22)	6.1	6.1
Zinc	89.9	67.8	44.5	44.2	410	960

	Concentration (mg/Kg DW)					
Metal	**NFK503 0 - 2 cm**	**NFK503 0 - 10 cm**	**NFK504 0 - 2 cm**	**NFK504 0 - 10 cm**	**SQS**	**CSL**
Arsenic	10	14	5.6	4.8	57	93
Cadmium	0.23	0.31	<MDL (0.18)	<MDL (0.17)	5.1	6.7
Chromium	22.2	25.9	12.3	9.86	260	270
Copper	33.5	38.0	13.5	11.3	390	390
Lead	15.2	17.2	5.4	4.2	450	530
Mercury	0.091	0.073	<MDL (0.022)	<MDL (0.024)	0.41	0.59
Silver	<MDL (0.31)	<MDL (0.35)	<MDL (0.22)	<MDL (0.22)	6.1	6.1
Zinc	77.2	93.6	43.3	40.8	410	960

Notes

mg/Kg DW - Milligrams per kilogram dry weight, based on percent solids analysis.

<MDL (#) - Analyte not detected above the *method detection limit*. Value is parentheses is the numeric MDL.

Table 5
Sediment Ionic Organic Results
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Four, April 2003

	Concentration (µg/Kg DW)					
Ionic Organics	**NFK501 0 - 2 cm**	**NFK501 0 - 10 cm**	**NFK502 0 - 2 cm**	**NFK502 0 - 10 cm**	**SQS**	**CSL**
Benzoic Acid	563	210	40	38	650	650
Benzyl Alcohol	<MDL (14)	<MDL (10)	<MDL (6.6)	<MDL (6.9)	57	73
2,4-Dimethylphenol	<MDL (16)	<MDL (12)	<MDL (7.7)	<MDL (8.0)	29	29
2-Methylphenol	<MDL (43)	<MDL (33)	<MDL (21)	<MDL (22)	63	63
4-Methylphenol	<MDL (37)	55	<MDL (18)	<MDL (18)	670	670
Pentachlorophenol	<MDL (11)	<MDL (8.7)	<MDL (5.5)	<MDL (5.7)	360	690
Phenol	75.7	28	<MDL (9.9)	<MDL (10)	420	1,200

	Concentration (µg/Kg DW)					
Ionic Organics	**NFK503 0 - 2 cm**	**NFK503 0 - 10 cm**	**NFK504 0 - 2 cm**	**NFK504 0 - 10 cm**	**SQS**	**CSL**
Benzoic Acid	250	180	46	38	650	650
Benzyl Alcohol	<MDL (12)	<MDL (12)	<MDL (7.1)	<MDL (7.1)	57	73
2,4-Dimethylphenol	<MDL (14)	<MDL (14)	<MDL (8.3)	<MDL (8.3)	29	29
2-Methylphenol	<MDL (39)	<MDL (37)	<MDL (22)	<MDL (22)	63	63
4-Methylphenol	112	<MDL (31)	<MDL (19)	<MDL (19)	670	670
Pentachlorophenol	<MDL (10)	<MDL (9.7)	<MDL (5.9)	<MDL (5.9)	360	690
Phenol	33	<MDL (17)	<MDL (11)	<MDL (11)	420	1,200

Notes

µg/Kg DW - Micrograms per kilogram dry weight, based on percent solids analysis.

<MDL (#) - Analyte not detected above the *method detection limit*. Value in parentheses is the numeric MDL.

Table 6

Sediment Non-Ionic Organic Results (Organic Carbon Normalized)

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Four, April 2003

	Concentration (mg/Kg OC)					
Non-Ionic Organics	**NFK501 0 - 2 cm TOC 2.93%**	**NFK501 0 - 10 cm TOC 2.21%**	**NFK502 0 - 2 cm TOC 0.17%**	**NFK502 0 - 10 cm TOC 0.26%**	**SQS**	**CSL**
LPAHs						
Acenaphthene	0.78	0.68	<MDL (4.6)	<MDL (3.1)	16	57
Acenaphthylene	<MDL (1.2)	<MDL (1.2)	<MDL (10)	<MDL (6.6)	66	66
Anthracene	0.771	0.674	<MDL (2.6)	<MDL (1.8)	220	1,200
Fluorene	<MDL (1.0)	<MDL (1.0)	<MDL (8.3)	<MDL (5.9)	23	79
2-Methylnaphthalene	<MDL (1.1)	<MDL (1.1)	<MDL (8.9)	<MDL (6.3)	38	64
Naphthalene	<MDL (1.1)	<MDL (1.1)	<MDL (8.9)	<MDL (6.3)	99	170
Phenanthrene	6.45	5.25	5.41	8.28	100	480
Total LPAH	8.0	6.6	5.41	8.28	370	780
HPAHs						
Benzo(a)anthracene	3.89	3.48	4.76	7.42	110	270
Benzo(a)pyrene	5.26	4.57	7.10	6.41	99	210
Benzofluoranthenes (Total)	13.5	12.3	16.0	14.9	230	450
Benzo(g,h,i)perylene	4.61	4.48	<MDL (5.2)	3.9	31	78
Chrysene	6.93	6.33	7.40	13.2	110	460
Dibenzo(a,h)anthracene	1.29	0.86	<MDL (4.6)	<MDL (3.1)	12	33
Fluoranthene	13.5	11.4	14.3	17.0	160	1,200
Indeno(1,2,3-c,d)pyrene	4.06	3.68	<MDL (5.9)	<MDL (3.9)	34	88
Pyrene	9.69	10.6	12.7	15.5	1,000	1,400
Total HPAH	62.7	58	62.3	78	960	5,300
Chlorobenzenes						
1,2-Dichlorobenzene	<MDL (0.020)	<MDL (0.020)	<MDL (0.17)	<MDL (0.12)	2.3	2.3
1,4-Dichlorobenzene	0.300	0.305	0.313	0.214	3.1	9
Hexachlorobenzene	<MDL (0.051)	<MDL (0.050)	<MDL (0.43)	<MDL (0.30)	0.38	2.3
1,2,4-Trichlorobenzene	<MDL (0.020)	<MDL (0.020)	<MDL (0.17)	<MDL (0.12)	0.81	1.8
Phthalates						
Bis(2-ethylhexyl) Phthalate	33.0, B	25.3, B	28.5, B	23.7, B	47	78
Benzyl Butyl Phthalate	2.52, B10	1.76, B5	11.7, B5	5.1, B5	4.9	64
Di-N-butyl Phthalate	1.12, B5	1.12, B5	5.5, B5	4.73, B5	220	1,700
Di-N-octyl Phthalate	4.98	<MDL (0.63)	<MDL (5.2)	<MDL (3.6)	58	4,500
Diethyl Phthalate	<MDL (0.48)	<MDL (0.45)	<MDL (3.9)	<MDL (2.7)	61	110
Dimethyl Phthalate	<MDL (0.85)	<MDL (0.86)	<MDL (7.1)	<MDL (5.1)	53	53
Miscellaneous Compounds						
Dibenzofuran	<MDL (1.1)	<MDL (1.1)	<MDL (8.9)	<MDL (6.3)	15	58
Hexachlorobutadiene	<MDL (0.058)	<MDL (0.059)	<MDL (0.49)	<MDL (0.34)	3.9	6.2
N-Nitrosodiphenylamine	<MDL (1.6)	<MDL (1.6)	<MDL (13)	<MDL (9.0)	11	11
PCBs						
Total PCBs	4.28	4.06	<MDL (1.3 - 2.6)	8.19	12	65

Notes

mg/Kg OC - Milligrams per kilogram organic carbon, based on total organic carbon analysis.

<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.

TOC % - Percent total organic carbon on a dry weight basis, based on total solids analysis.

B5, B10, B - Compound detected in laboratory method blank. Sample concentration is less than 5 times the method blank concentration (B5), greater than 5 times but less than 10 times the method blank concentration (B10), or greater than 10 times the method blank concentration (B).

Table 6 (cont.)
Sediment Non-Ionic Organic Results (Organic Carbon Normalized)
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Four, April 2003

	Concentration (mg/Kg OC)					
Non-Ionic Organics	NFK503 0 - 2 cm TOC 2.76%	NFK503 0 - 10 cm TOC 2.43%	NFK504 0 - 2 cm TOC 0.23%	NFK504 0 - 10 cm TOC 0.11%	SQS	CSL
LPAHs						
Acenaphthene	<MDL (0.51)	<MDL (0.58)	<MDL (3.6)	<MDL (7.5)	16	57
Acenaphthylene	<MDL (1.1)	<MDL (1.2)	<MDL (7.9)	<MDL (16)	66	66
Anthracene	0.51	0.62	<MDL (2.1)	<MDL (4.3)	220	1,200
Fluorene	<MDL (0.98)	<MDL (1.0)	<MDL (6.6)	<MDL (14)	23	79
2-Methylnaphthalene	<MDL (1.1)	<MDL (1.1)	<MDL (7.5)	<MDL (15)	38	64
Naphthalene	<MDL (1.1)	<MDL (1.1)	<MDL (7.5)	<MDL (15)	99	170
Phenanthrene	3.73	4.49	13.2	5.0	100	480
Total LPAH	4.2	5.1	13.2	5.0	370	780
HPAHs						
Benzo(a)anthracene	2.49	3.17	2.0	5.44	110	270
Benzo(a)pyrene	3.24	4.08	1.9	6.65	99	210
Benzofluoranthenes (Total)	8.15	9.75	6.7	15.7	230	450
Benzo(g,h,i)perylene	2.80	3.29	<MDL (4.2)	<MDL (8.5)	31	78
Chrysene	4.17	5.19	3.68	6.6	110	460
Dibenzo(a,h)anthracene	0.54	0.78	<MDL (3.6)	<MDL (7.5)	12	33
Fluoranthene	7.83	10.2	14.2	14	160	1,200
Indeno(1,2,3-c,d)pyrene	2.29	2.75	<MDL (4.8)	<MDL (10)	34	88
Pyrene	6.88	8.81	10.9	13.7	1,000	1,400
Total HPAH	38	48	39	62	960	5,300
Chlorobenzenes						
1,2-Dichlorobenzene	<MDL (0.019)	<MDL (0.021)	<MDL (0.14)	<MDL (0.28)	2.3	2.3
1,4-Dichlorobenzene	0.133	0.0761	<MDL (0.066)	<MDL (0.14)	3.1	9
Hexachlorobenzene	<MDL (0.051)	0.10	<MDL (0.34)	<MDL (0.71)	0.38	2.3
1,2,4-Trichlorobenzene	<MDL (0.019)	<MDL (0.021)	<MDL (0.14)	<MDL (0.28)	0.81	1.8
Phthalates						
Bis(2-ethylhexyl) Phthalate	22.1, B	24.3, B	13.9, B5	18.1, B5	47	78
Benzyl Butyl Phthalate	1.88, B10	1.53, B5	<MDL (3.1)	10, B5	4.9	64
Di-N-butyl Phthalate	1.28, B5	1.09, B5	4.4, B5	9.1, B5	220	1,700
Di-N-octyl Phthalate	<MDL (0.58)	<MDL (0.62)	<MDL (4.2)	<MDL (8.5)	58	4,500
Diethyl Phthalate	<MDL (0.43)	<MDL (0.49)	<MDL (3.1)	<MDL (6.5)	61	110
Dimethyl Phthalate	<MDL (0.83)	<MDL (0.86)	<MDL (5.7)	<MDL (12)	53	53
Miscellaneous Compounds						
Dibenzofuran	<MDL (1.1)	<MDL (1.1)	<MDL (7.5)	<MDL (15)	15	58
Hexachlorobutadiene	<MDL (0.054)	<MDL (0.058)	<MDL (0.39)	<MDL (0.80)	3.9	6.2
N-Nitrosodiphenylamine	<MDL (1.5)	<MDL (1.6)	<MDL (11)	<MDL (22)	11	11
PCBs						
Total PCBs	4.13	7.93	<MDL (1.1 - 2.1)	<MDL (2.2 - 4.3)	12	65

Notes

mg/Kg OC - Milligrams per kilogram organic carbon, based on total organic carbon analysis.

<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.

TOC % - Percent total organic carbon on a dry weight basis, based on total solids analysis.

B5, B10, B - Compound detected in laboratory method blank. Sample concentration is less than 5 times the method blank concentration (B5), greater than 5 times but less than 10 times the method blank concentration (B10), or greater than 10 times the method blank concentration (B).

Table 7

Sediment Non-Ionic Organic Results (Dry Weight Normalized)

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Four, April 2003

	Concentration (µg/Kg DW)					
Non-Ionic Organics	**NFK501 0 - 2 cm TOC 2.93%**	**NFK501 0 - 10 cm TOC 2.21%**	**NFK502 0 - 2 cm TOC 0.17%**	**NFK502 0 - 10 cm TOC 0.26%**	**LAET* SQS**	**2LAET* CSL**
LPAHs						
Acenaphthene	23	15	<MDL (7.7)	<MDL (8.0)	500	730
Acenaphthylene	<MDL (34)	<MDL (26)	<MDL (17)	<MDL (17)	1,300	1,300
Anthracene	22.6	14.9	<MDL (4.4)	<MDL (4.6)	960	4,400
Fluorene	<MDL (30)	<MDL (22)	<MDL (14)	<MDL (15)	540	1,000
2-Methylnaphthalene	<MDL (32)	<MDL (24)	<MDL (15)	<MDL (16)	670	1,400
Naphthalene	<MDL (32)	<MDL (24)	<MDL (15)	<MDL (16)	2,100	2,400
Phenanthrene	189	116	9.14	21.2	1,500	5,400
Total LPAH	230	150	9.14	21.2	5,200	13,000
HPAHs						
Benzo(a)anthracene	114	76.8	8.04	19.0	1,300	1,600
Benzo(a)pyrene	154	101	12.0	16.4	1,600	3,000
Benzofluoranthenes (Total)	396	272	27.1	38.1	3,200	3,600
Benzo(g,h,i)perylene	135	99.1	<MDL (8.8)	10	670	720
Chrysene	203	140	12.5	33.8	1,400	2,800
Dibenzo(a,h)anthracene	37.8	19	<MDL (7.7)	<MDL (8.0)	230	540
Fluoranthene	396	253	24.2	43.4	1,700	2,500
Indeno(1,2,3-c,d)pyrene	119	81.3	<MDL (9.9)	<MDL (10)	600	690
Pyrene	284	235	21.5	39.7	2,600	3,300
Total HPAH	1,840	1,300	105	200	12,000	17,000
Chlorobenzenes						
1,2-Dichlorobenzene	<MDL (0.59)	<MDL (0.45)	<MDL (0.29)	<MDL (0.30)	35	50
1,4-Dichlorobenzene	8.79	6.73	0.530	0.549	110	120
Hexachlorobenzene	<MDL (1.5)	<MDL (1.1)	<MDL (0.73)	<MDL (0.76)	22	70
1,2,4-Trichlorobenzene	<MDL (0.59)	<MDL (0.45)	<MDL (0.29)	<MDL (0.30)	31	51
Phthalates						
Bis(2-ethylhexyl) Phthalate	968, B	559, B	48.1, B5	60.6, B5	1,300	1,900
Benzyl Butyl Phthalate	73.9, B10	38.9, B5	19.7, B5	13, B5	63	470
Di-N-butyl Phthalate	32.7, B5	24.7, B5	9.3, B5	12.1, B5	1,400	5,100
Di-N-octyl Phthalate	146	<MDL (14)	<MDL (8.8)	<MDL (9.2)	420	2,100
Diethyl Phthalate	<MDL (14)	<MDL (10)	<MDL (6.6)	<MDL (6.9)	48	73
Dimethyl Phthalate	<MDL (25)	<MDL (19)	<MDL (12)	<MDL (13)	71	160
Miscellaneous Compounds						
Dibenzofuran	<MDL (32)	<MDL (24)	<MDL (15)	<MDL (16)	540	700
Hexachlorobutadiene	<MDL (1.7)	<MDL (1.3)	<MDL (0.83)	<MDL (0.86)	11	120
N-Nitrosodiphenylamine	<MDL (46)	<MDL (35)	<MDL (22)	<MDL (23)	28	40
PCBs						
Total PCBs	125	89.8	<MDL (2.2 - 4.4)	21.0	130	1,000

Notes

µg/Kg DW - Micrograms per kilogram dry weight, based on percent solids analysis.

<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.

* - LAET/2LAET equivalent to SQS/CSL criteria, respectively.

B5, B10, B - Compound detected in laboratory method blank. Sample concentration is less than 5 times the method blank concentration (B5), greater than 5 times but less than 10 times the method blank concentration (B10), or greater than 10 times the method blank concentration (B).

Table 7 (cont.)

Sediment Non-Ionic Organic Results (Dry Weight Normalized)

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Four, April 2003

	Concentration (µg/Kg DW)					
Non-Ionic Organics	**NFK503 0 - 2 cm TOC 2.76%**	**NFK503 0 - 10 cm TOC 2.43%**	**NFK504 0 - 2 cm TOC 0.23%**	**NFK504 0 - 10 cm TOC 0.11%**	**LAET* SQS**	**2LAET* CSL**
LPAHs						
Acenaphthene	<MDL (14)	<MDL (14)	<MDL (8.3)	<MDL (8.3)	500	730
Acenaphthylene	<MDL (31)	<MDL (29)	<MDL (18)	<MDL (18)	1,300	1,300
Anthracene	14	15	<MDL (4.7)	<MDL (4.7)	960	4,400
Fluorene	<MDL (27)	<MDL (25)	<MDL (15)	<MDL (15)	540	1,000
2-Methylnaphthalene	<MDL (29)	<MDL (27)	<MDL (17)	<MDL (17)	670	1,400
Naphthalene	<MDL (29)	<MDL (27)	<MDL (17)	<MDL (17)	2,100	2,400
Phenanthrene	103	109	30.1	5.5	1,500	5,400
Total LPAH	120	120	30.1	5.5	5,200	13,000
HPAHs						
Benzo(a)anthracene	68.7	77.0	4.6	5.98	1,300	1,600
Benzo(a)pyrene	89.3	99.2	4.4	7.32	1,600	3,000
Benzofluoranthenes (Total)	225	237	15	17.2	3,200	3,600
Benzo(g,h,i)perylene	77.4	79.9	<MDL (9.5)	<MDL (9.4)	670	720
Chrysene	115	126	8.4	7.3	1,400	2,800
Dibenzo(a,h)anthracene	15	19	<MDL (8.3)	<MDL (8.3)	230	540
Fluoranthene	216	249	32.4	15	1,700	2,500
Indeno(1,2,3-c,d)pyrene	63.2	66.8	<MDL (11)	<MDL (11)	600	690
Pyrene	190	214	24.9	15.1	2,600	3,300
Total HPAH	1,100	1,200	90	68	12,000	17,000
Chlorobenzenes						
1,2-Dichlorobenzene	<MDL (0.53)	<MDL (0.50)	<MDL (0.31)	<MDL (0.31)	35	50
1,4-Dichlorobenzene	3.68	1.85	<MDL (0.15)	<MDL (0.15)	110	120
Hexachlorobenzene	<MDL (1.4)	2.5	<MDL (0.78)	<MDL (0.78)	22	70
1,2,4-Trichlorobenzene	<MDL (0.53)	<MDL (0.50)	<MDL (31)	<MDL (31)	31	51
Phthalates						
Bis(2-ethylhexyl) Phthalate	609, B	591, B	31.6, B5	19.9, B5	1,300	1,900
Benzyl Butyl Phthalate	51.9, B10	37.1, B5	<MDL (7.1)	11, B5	63	470
Di-N-butyl Phthalate	35.2, B5	26.4, B5	10, B5	10, B5	1,400	5,100
Di-N-octyl Phthalate	<MDL (16)	<MDL (15)	<MDL (9.5)	<MDL (9.4)	420	2,100
Diethyl Phthalate	<MDL (12)	<MDL (12)	<MDL (7.1)	<MDL (7.1)	48	73
Dimethyl Phthalate	<MDL (23)	<MDL (21)	<MDL (13)	<MDL (13)	71	160
Miscellaneous Compounds						
Dibenzofuran	<MDL (29)	<MDL (27)	<MDL (17)	<MDL (17)	540	700
Hexachlorobutadiene	<MDL (1.5)	<MDL (1.4)	<MDL (0.89)	<MDL (0.88)	11	120
N-Nitrosodiphenylamine	<MDL (41)	<MDL (39)	<MDL (24)	<MDL (24)	28	40
PCBs						
Total PCBs	114	193	<MDL (2.4 - 4.7)	<MDL (2.4 - 4.7)	130	1,000

Notes

µg/Kg DW - Micrograms per kilogram dry weight, based on percent solids analysis.

<MDL (#) - Analyte not detected above the *method dection limit*. Value in parentheses is the numeric MDL.

* - LAET/2LAET equivalent to SQS/CSL criteria, respectively.

B5, B10, B - Compound detected in laboratory method blank. Sample concentration is less than 5 times the method blank concentration (B5), greater than 5 times but less than 10 times the method blank concentration (B10), or greater than 10 times the method blank concentration (B).

Table 8

Dry Weight Comparison of Detected Sediment Constituents (0 - 10 cm Depth Stratum)

April 1999, October 1999, April 2000, April 2001, April 2002, and April 2003 Monitoring Events

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Four, April 2003

	Norfolk CSO Channel (NFK501)						Combined Channel Delta (NFK502)					
	Baseline	6 Month	Year One	Year Two	Year Three	Year Four	Baseline	6 Month	Year One	Year Two	Year Three	Year Four
Constituent	**Apr-99**	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-99**	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**
Total Organic Carbon (%)	0.18	0.32	0.24	0.87	2.13	2.21	0.12	0.37	0.14	0.50	0.10	0.26
Total Organic Carbon (mg/Kg dry weight)	1,760	3,240	2,350	8,670	21,300	22,100	1,210	3,730	1,440	4,990	980	2,560
Grain Size (% wet weight)												
Gravel	0.8	0.1	0.3	1.5	0.9	1.2	0.4	0.5	1.1	0	0.9	1.7
Sand	98.6	95.6	94.3	78.8	60.2	69.8	95.5	89.9	92.6	90.7	96.8	91.8
Silt	1.0	3.4	4.9	16.6	32.5	25.3	4.7	9.3	5.8	6.8	1.6	6.3
Clay	0	0.7	0.1	3.7	6.4	3.7	0	0.9	0	2.4	0.6	0
Metals (mg/Kg dry weight)												
Arsenic	<MDL (3.3)	3.5	4.1	<MDL (3.8)	5.4	8.3	3.7	3.5	4.6	<MDL (3.6)	3.3	4.7
Cadmium	0.20	< MDL (0.20)	< MDL (0.21)	< MDL (0.23)	<MDL (0.26)	0.16	0.21	< MDL (0.19)	< MDL (0.20)	< MDL (0.23)	<MDL (0.17)	<MDL (0.17)
Chromium	12.9	17.1	14.1	17.4	19.5	14.1	13.0	13.9	12.5	13.3	10.1	12.1
Copper	11.4	13.4	12.0	18.5	27.0	23.7	12.2	13.8	11.2	13.1	11.2	13.3
Lead	4.2	5.2	5.7	7.36	12	13	5.0	5.7	5.4	7.83	4.3	4.2
Mercury	0.055	< MDL (0.027)	< MDL (0.026)	0.043	0.064	0.062	0.089	0.043	< MDL (0.027)	<MDL (0.030)	<MDL (0.023)	<MDL (0.023)
Zinc	46.0	51.3	43.7	59.0	79.0	67.8	43.2	52.5	46.8	46.5	43.9	44.2
Organics (µg/Kg dry weight)												
Acenaphthene (LPAH)	<MDL (14)	<MDL (15)	<MDL (15)	<MDL (11)	<MDL (13)	15	<MDL (14)	<MDL (15)	<MDL (15)	<MDL (11)	<MDL (8.6)	<MDL (8.0)
Anthracene (LPAH)	<MDL (21)	<MDL (21)	<MDL (22)	11	20.2	14.9	<MDL (21)	<MDL (22)	<MDL (22)	7.2	<MDL (4.9)	<MDL (2.3)
Benzo(a)anthracene (HPAH)	< MDL (21)	< MDL (21)	< MDL (22)	40.8	94.9	76.8	< MDL (21)	28	< MDL (22)	38.0	8.76	19
Benzo(a)pyrene (HPAH)	<MDL (35)	<MDL (36)	<MDL (37)	61.4	117	101	<MDL (35)	<MDL (38)	<MDL (37)	24.5	13.7	16.4
Benzofluoranthenes-Total (HPAH)	<MDL (56)	<MDL (58)	<MDL (59)	174	265	272	<MDL (56)	<MDL (60)	<MDL (58)	118	11.8	38.1
Benzo(g,h,i)perylene (HPAH)	< MDL (35)	< MDL (36)	< MDL (37)	18	74.7	99.1	75.7	< MDL (38)	< MDL (37)	<MDL (12)	<MDL (9.8)	10
Benzoic Acid	< MDL (140)	< MDL (150)	210	122	174	210	< MDL (140)	< MDL (150)	150	152	84.3	38
Chrysene (HPAH)	< MDL (21)	< MDL (21)	< MDL (22)	62.1	157	140	< MDL (21)	29	< MDL (22)	42.0	<MDL (4.9)	33.8
Dibenzo(a,h)anthracene (HPAH)	<MDL (56)	<MDL (58)	<MDL (59)	<MDL (11)	21	19	<MDL (56)	<MDL (60)	<MDL (58)	<MDL (11)	<MDL (8.6)	<MDL (8.0)
Fluoranthene (HPAH)	< MDL (21)	32	26	124	287	253	< MDL (21)	56.7	< MDL (22)	100	<MDL (9.8)	43.4
Hexachlorobenzene	<MDL (0.90)	<MDL (0.92)	<MDL (0.95)	<MDL (1.0)	<MDL (1.2)	<MDL (1.1)	<MDL (0.89)	<MDL (0.96)	<MDL (0.94)	<MDL (0.99)	<MDL (0.81)	<MDL (0.76)
Indeno(1,2,3-c,d)pyrene (HPAH)	<MDL (35)	<MDL (36)	<MDL (37)	21	75.3	81.3	<MDL (35)	<MDL (38)	<MDL (37)	<MDL (14)	<MDL (11)	<MDL (10)
4-Methylphenol	<MDL (35)	<MDL (36)	<MDL (37)	<MDL (24)	<MDL (30)	55	<MDL (35)	<MDL (38)	<MDL (37)	<MDL (24)	<MDL (20)	<MDL (18)
Phenanthrene (LPAH)	21	< MDL (21)	< MDL (22)	46.8	135	116	< MDL (21)	29	< MDL (22)	31.6	<MDL (4.9)	21.2
Phenol	<MDL (140)	<MDL (150)	<MDL (150)	<MDL (14)	<MDL (17)	28	<MDL (140)	<MDL (150)	<MDL (150)	<MDL (14)	<MDL (11)	<MDL (10)
Pyrene (HPAH)	< MDL (21)	29	< MDL (22)	95.7	260	235	< MDL (21)	47.9	< MDL (22)	50.7	6.6	39.7
Total PCBs	< MDL (22)	20.9	< MDL (5.8)	35.5	174	89.8	< MDL (22)	71.6	10	94.1	<MDL (2.5 - 4.9)	21.0

Notes

mg/Kg dry weight - Milligrams per kilogram normalized to dry weight based on percent solids analysis.

µg/Kg dry weight - Micrograms per kilogram normalized to dry weight based on percent solids analysis.

< MDL (#) - Analyte not detected above the *method detection limit*. Value in parentheses is the numeric MDL.

Table 8 (cont.)

Dry Weight Comparison of Detected Sediment Constituents (0 - 10 cm Depth Stratum)

April 1999, October 1999, April 2000, April 2001, April 2002, and April 2003 Monitoring Events

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Four, April 2003

	Boeing Storm Drain Channel (NFK503)						Upriver Reference (NFK504)					
	Baseline	6 Month	Year One	Year Two	Year Three	Year Four	Baseline	6 Month	Year One	Year Two	Year Three	Year Four
Constituent	**Apr-99**	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Apr-99**	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**
Total Organic Carbon (%)	0.32	0.31	0.20	0.36	2.55	2.43	0.13	0.19	0.31	0.91	1.31	0.11
Total Organic Carbon (mg/Kg dry weight)	3,180	3,070	2,010	3,600	25,500	24,300	1,260	1,890	3,090	9,080	13,100	1,100
Grain Size (% wet weight)												
Gravel	0.4	1.1	0.8	1.0	0.2	1.0	0.4	0.9	0.6	0.5	1.1	3.1
Sand	94.3	92.5	96.1	97.0	47.2	55.0	96.7	96.4	90.0	65.4	72.9	94.3
Silt	5.4	6.2	3.5	1.5	45.8	38.7	2.9	1.8	9.1	27.7	22.5	2.5
Clay	0	0.7	0	0.6	6.8	5.5	0	0.7	0.1	6.6	3.7	0
Metals (mg/Kg dry weight)												
Arsenic	<MDL (3.2)	4.3	4.4	<MDL (3.2)	11	14	3.5	5.7	6.0	<MDL (0.42)	4.8	4.8
Cadmium	<MDL (0.19)	< MDL (0.21)	< MDL (0.21)	< MDL (0.20)	<MDL (0.28)	0.31	0.21	< MDL (0.19)	< MDL (0.20)	<MDL (0.25)	<MDL (0.24)	<MDL (0.17)
Chromium	14.7	14.1	12.2	12.0	21.7	25.9	12.2	16.4	14.0	17.8	17.6	9.86
Copper	10.5	14.5	11.2	12.9	31.9	38.0	11.2	13.7	15.1	18.8	22.4	11.3
Lead	4.4	5.5	6.5	18.0	12	17.2	4.6	5.5	6.7	13.8	11	4.2
Mercury	0.066	0.052	< MDL (0.028)	0.10	0.074	0.073	0.072	< MDL (0.026)	< MDL (0.027)	0.038	0.068	<MDL (0.024)
Zinc	42.1	53.7	44.5	46.4	79.9	93.6	44.2	52.9	46.8	60.6	61.9	40.8
Organics (µg/Kg dry weight)												
Acenaphthene (LPAH)	<MDL (14)	<MDL (15)	<MDL (15)	<MDL (9.4)	<MDL (14)	<MDL (14)	<MDL (14)	<MDL (15)	<MDL (15)	<MDL (12)	<MDL (11)	<MDL (8.3)
Anthracene (LPAH)	<MDL (21)	<MDL (22)	<MDL (22)	<MDL (5.4)	14	15	<MDL (21)	<MDL (22)	<MDL (21)	<MDL (6.7)	12	<MDL (4.7)
Benzo(a)anthracene (HPAH)	< MDL (21)	28	< MDL (22)	3.0	77.1	77.0	< MDL (21)	< MDL (22)	< MDL (21)	18.0	59.5	5.98
Benzo(a)pyrene (HPAH)	<MDL (35)	<MDL (37)	<MDL (37)	<MDL (4.0)	89.2	99.2	<MDL (35)	<MDL (37)	<MDL (36)	<MDL (5.0)	72.4	7.32
Benzofluoranthenes-Total (HPAH)	<MDL (56)	<MDL (59)	<MDL (59)	<MDL (4.0)	191	237	<MDL (56)	<MDL (58)	<MDL (57)	<MDL (25)	157	17.2
Benzo(g,h,i)perylene (HPAH)	70.5	< MDL (37)	< MDL (37)	<MDL (11)	38.2	79.9	< MDL (35)	< MDL (37)	< MDL (36)	<MDL (13)	15	<MDL (9.4)
Benzoic Acid	< MDL (140)	< MDL (150)	< MDL (150)	67.6	178	180	< MDL (140)	< MDL (150)	150	168	130	38
Chrysene (HPAH)	< MDL (21)	43	< MDL (22)	<MDL (5.4)	116	126	< MDL (21)	< MDL (22)	35	8.2	89.8	7.3
Dibenzo(a,h)anthracene (HPAH)	<MDL (56)	<MDL (59)	<MDL (59)	<MDL (9.4)	<MDL (14)	19	<MDL (55)	<MDL (58)	<MDL (57)	<MDL (12)	<MDL (11)	<MDL (8.3)
Fluoranthene (HPAH)	< MDL (21)	66.9	26	<MDL (11)	201	249	< MDL (21)	< MDL (22)	63.6	27.5	160	15
Hexachlorobenzene	<MDL (0.90)	<MDL (0.95)	<MDL (0.95)	<MDL (0.89)	<MDL (1.3)	2.5	<MDL (0.89)	<MDL (0.93)	<MDL (0.92)	<MDL (1.1)	<MDL (1.1)	<MDL (0.78)
Indeno(1,2,3-c,d)pyrene (HPAH)	<MDL (35)	<MDL (37)	<MDL (37)	<MDL (12)	52.2	66.8	<MDL (35)	<MDL (37)	<MDL (36)	<MDL (15)	36.9	<MDL (11)
4-Methylphenol	<MDL (35)	<MDL (37)	<MDL (37)	<MDL (22)	<MDL (32)	<MDL (31)	<MDL (35)	<MDL (37)	<MDL (36)	<MDL (27)	<MDL (26)	<MDL (19)
Phenanthrene (LPAH)	< MDL (21)	40.3	< MDL (22)	<MDL (5.4)	93.6	109	< MDL (21)	< MDL (22)	< MDL (21)	10	58.5	5.5
Phenol						<MDL (17)	<MDL (140)	<MDL (150)	<MDL (150)	<MDL (15)	<MDL (15)	<MDL (11)
Pyrene (HPAH)	< MDL (21)	64.6	< MDL (22)	<MDL (5.4)	191	214	< MDL (21)	< MDL (22)	47.9	<MDL (6.7)	137	15.1
Total PCBs	< MDL (22)	182	179	1,330	777	193	< MDL (22)	< MDL (5.7)	13.2	31	51.5	<MDL (2.4 - 4.7)

Notes

mg/Kg dry weight - Milligrams per kilogram normalized to dry weight based on percent solids analysis.

µg/Kg dry weight - Micrograms per kilogram normalized to dry weight based on percent solids analysis.

< MDL (#) - Analyte not detected above the *method detection limit*. Value in parentheses is the numeric MDL.

Table 9

Dry Weight Comparison of Detected Sediment Constituents (0 - 2 cm Depth Stratum)
October 1999, April 2000, April 2001, April 2002, and April 2003 Monitoring Events

Norfolk CSO Sediment Remediation Project

Five-Year Monitoring Program, Year Four, April 2003

	Norfolk CSO Channel (NFK501)					Combined Channel Delta (NFK502)					Boeing Storm Drain Channel (NFK503)				
	6 Month	Year One	Year Two	Year Three	Year Four	6 Month	Year One	Year Two	Year Three	Year Four	6 Month	Year One	Year Two	Year Three	Year Four
Constituent	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**
Total Organic Carbon (%)	0.42	0.55	0.82	2.30	2.93	0.70	0.34	0.65	0.13	0.17	0.65	0.49	0.28	2.62	2.76
Total Organic Carbon (mg/Kg dry weight)	4,170	5,530	8,180	23,000	29,300	7,030	3,390	6,510	1,260	1,690	6,490	4,930	2,770	26,200	27,600
Grain Size (% wet weight)															
Gravel	0.5	0.1	0.2	0.2	1.0	0.6	0.8	0	0.8	2.9	1.3	0.5	1.0	0.2	0.8
Sand	91.0	83.6	81.5	53.3	56.4	83.6	86.9	89.1	93.2	92.0	90.8	93.7	95.9	44.6	40.3
Silt	6.8	14.8	14.5	39.5	36.0	13.2	12.7	7.7	5.5	5.2	6.8	5.9	2.6	46.7	52.6
Clay	1.6	0.9	3.8	7.1	6.7	3.4	0.1	3.1	0.6	0	1.5	0.1	0.6	8.5	6.1
Metals (mg/Kg dry weight)															
Arsenic	4.6	5.1	<MDL (3.6)	7.4	7.8	6.2	5.3	<MDL (3.6)	4.6	4.3	4.0	5.0	<MDL (3.3)	5.7	10
Cadmium	<MDL (0.20)	<MDL (0.20)	<MDL (0.22)	<MDL (0.32)	0.23	<MDL (0.23)	<MDL (0.21)	<MDL (0.21)	<MDL (0.18)	<MDL (0.15)	<MDL (0.21)	<MDL (0.21)	<MDL (0.20)	<MDL (0.30)	0.23
Chromium	15.6	17.1	16.1	19.8	18.0	14.7	15.2	16.7	11.2	15.1	15.4	13.0	13.9	15.8	22.2
Copper	15.5	14.1	17.2	27.4	30.9	18.6	13.3	15.5	11.7	13.7	17.1	13.4	11.4	16.9	33.5
Lead	6.2	6.4	11.6	12	222	9.0	7.0	9.39	4.4	3.5	6.3	6.5	7.36	8.0	15.2
Mercury	0.039	0.043	0.069	0.076	0.11	0.042	0.063	0.031	<MDL (0.023)	<MDL (0.022)	0.029	0.028	<MDL (0.025)	0.095	0.091
Zinc	52.4	48.4	56.6	76.4	89.9	62.2	49.4	51.6	43.7	44.5	52.6	46.0	43.4	71.9	77.2
Organics (µg/Kg dry weight)															
Acenaphthene (LPAH)	<MDL (15)	<MDL (14)	<MDL (10)	<MDL (15)	23	<MDL (17)	<MDL (15)	<MDL (10)	<MDL (8.3)	<MDL (7.7)	<MDL (15)	<MDL (15)	<MDL (9.4)	<MDL (15)	<MDL (14)
Anthracene (LPAH)	<MDL (22)	<MDL (21)	8.0	21.9	22.6	<MDL (25)	<MDL (22)	7.3	<MDL (4.8)	<MDL (4.4)	<MDL (22)	<MDL (22)	<MDL (5.4)	17.5	14
Benzo(a)anthracene (HPAH)	26	37.5	60.4	120	114	56.7	< MDL (22)	37.9	7.26	8.04	48.8	< MDL (22)	8.14	92.4	68.7
Benzo(a)pyrene (HPAH)	< MDL (36)	41	92.6	153	154	59	< MDL (37)	56.8	12.1	12.0	53	< MDL (37)	<MDL (4.0)	110	89.3
Benzofluoranthenes-Total (HPAH)	< MDL (58)	57	198	359	396	< MDL (67)	< MDL (59)	128	9.31	27	76	< MDL (59)	16	213	225
Benzo(g,h,i)perylene (HPAH)	76.2	< MDL (35)	24.8	96.6	135	< MDL (42)	< MDL (37)	<MDL (12)	<MDL (9.5)	<MDL (8.8)	< MDL (38)	< MDL (37)	<MDL (11)	52.5	77.4
Benzoic Acid	170	258	299	210	563	250	227	162	<MDL (7.1)	40	< MDL (150)	226	80.9	192	250
Chrysene (HPAH)	32	58.2	81.9	213	203	84.7	29	49.0	<MDL (4.8)	12.5	72.4	34	7.9	146	115
Di-N-octyl Phthalate	<MDL (22)	<MDL (21)	<MDL (12)	<MDL (17)	146	<MDL (25)	<MDL (22)	<MDL (12)	<MDL (9.5)	(MDL (8.8)	<MDL (22)	<MDL (22)	<MDL (11)	<MDL (17)	<MDL (16)
Dibenzo(a,h)anthracene (HPAH)	<MDL (58)	<MDL (57)	<MDL (10)	25	37.8	<MDL (67)	<MDL (59)	<MDL (10)	<MDL (8.3)	<MDL (7.7)	<MDL (60)	<MDL (59)	<MDL (9.4)	18	15
Fluoranthene (HPAH)	60.2	101	162	363	396	132	54.0	110	<MDL (9.5)	24.2	119	52.2	24.5	249	216
Indeno(1,2,3-c,d)pyrene (HPAH)	< MDL (36)	< MDL (35)	33.6	104	119	46	< MDL (37)	22	<MDL (11)	<MDL (9.9)	< MDL (38)	< MDL (37)	<MDL (12)	58.9	63.2
4-Methylphenol	<MDL (36)	<MDL (35)	<MDL (23)	<MDL (34)	<MDL (37)	<MDL (42)	<MDL (37)	<MDL (24)	<MDL (19)	<MDL (18)	<MDL (38)	<MDL (37)	<MDL (21)	<MDL (34)	112
Phenanthrene (LPAH)	28	44.7	65.3	183	189	62.4	25	39.0	<MDL (4.8)	9.14	80.1	25	8.4	114	103
Phenol	<MDL (150)	<MDL (140)	<MDL (13)	<MDL (19)	75.7	<MDL (170)	<MDL (150)	<MDL (13)	<MDL (11)	<MDL (9.9)	<MDL (150)	<MDL (150)	<MDL (12)	<MDL (19)	33
Pyrene (HPAH)	59.1	79.0	125	346	284	126	37.8	79.1	<MDL (4.8)	21.5	125	38.4	5.9	234	190
Total PCBs	45.9	6.8	60.9	168	125	61.8	70.6	161	<MDL (2.4 - 4.8)	<MDL (2.2 - 4.4)	306	271	1,880	260	114

Notes

mg/Kg dry weight - Milligrams per kilogram normalized to dry weight based on percent solids analysis.

µg/Kg dry weight - Micrograms per kilogram normalized to dry weight based on percent solids analysis.

< MDL (#) - Analyte not detected above the *method detection limit*. Value in parentheses is the numeric MDL.

Table 9 (cont.)

Dry Weight Comparison of Detected Sediment Constituents (0 - 2 cm Depth Stratum)
October 1999, April 2000, April 2001, April 2002, and April 2003 Monitoring Events
Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program , Year Four, April 2003

	Upriver Reference (NFK504)				
	6 Month	Year One	Year Two	Year Three	Year Four
Constituent	**Oct-99**	**Apr-00**	**Apr-01**	**Apr-02**	**Apr-03**
Total Organic Carbon (%)	0.56	0.79	1.56	1.08	0.23
Total Organic Carbon (mg/Kg dry weight)	5,610	7,900	15,600	10,800	2,280
Grain Size (% wet weight)					
Gravel	1.7	1.0	0.5	1.4	2.4
Sand	82.3	74.1	80.7	78.0	93.5
Silt	13.6	23.8	14.4	17.6	4.1
Clay	3.0	0.9	4.6	3.1	0
Metals (mg/Kg dry weight)					
Arsenic	6.3	7.3	<MDL (4.7)	5.9	5.6
Cadmium	<MDL (0.22)	<MDL (0.23)	<MDL (0.28)	<MDL (0.23)	<MDL (0.18)
Chromium	18.2	22.1	21.1	16.7	12.3
Copper	17.1	18.4	24.9	23.3	13.5
Lead	8.2	8.7	18.0	9.5	5.4
Mercury	0.028	0.049	0.072	0.040	<MDL (0.022)
Zinc	56.6	56.1	68.3	56.1	43.3
Organics (µg/Kg dry weight)					
Acenaphthene (LPAH)	<MDL (16)	<MDL (17)	<MDL (13)	<MDL (11)	<MDL (8.3)
Anthracene (LPAH)	<MDL (23)	<MDL (24)	<MDL (7.6)	39.8	<MDL (4.7)
Benzo(a)anthracene (HPAH)	36	66.0	24.9	171	4.6
Benzo(a)pyrene (HPAH)	< MDL (39)	59	<MDL (5.7)	61.7	4.4
Benzofluoranthenes-Total (HPAH)	64	110	33.6	145	15.3
Benzo(g,h,i)perylene (HPAH)	< MDL (39)	44	<MDL (15)	14	<MDL (9.5)
Benzoic Acid	190	380	268	129	46
Chrysene (HPAH)	53.1	94.7	17.2	384	8.4
Di-N-octyl Phthalate	<MDL (23)	<MDL (24)	<MDL (15)	<MDL (12)	<MDL (9.5)
Dibenzo(a,h)anthracene (HPAH)	<MDL (63)	<MDL (66)	<MDL (13)	<MDL (11)	<MDL (8.3)
Fluoranthene (HPAH)	76.1	178	50.3	259	32.4
Indeno(1,2,3-c,d)pyrene (HPAH)	< MDL (39)	52	<MDL (17)	26	<MDL (11)
4-Methylphenol	<MDL (39)	<MDL (41)	<MDL (30)	<MDL (25)	<MDL (19)
Phenanthrene (LPAH)	38	76.5	15.6	85.7	30.1
Phenol	<MDL (160)	<MDL (170)	<MDL (17)	<MDL (14)	<MDL (11)
Pyrene (HPAH)	75.9	159	<MDL (7.6)	240	24.9
Total PCBs	25	6.6	42.2	38.9	<MDL (2.4 - 4.7)

Notes

mg/Kg dry weight - Milligrams per kilogram normalized to dry weight based on percent solids analysis.
µg/Kg dry weight - Micrograms per kilogram normalized to dry weight based on percent solids analysis.
< MDL (#) - Analyte not detected above the *method detection limit*. Value in parentheses is the numeric MDL.

Table 10

Summary of Data Analysis for "B" Flagged Compounds
Benzyl Butyl Phthalate, Bis(2-ethylhexyl) Phthalate, and Di-N-butyl Phthalate

Norfolk CSO Sediment Remediation Project
Five-Year Monitoring Program, Year Four, April 2003

Benzyl Butyl Phthalate (method blank concentration of 9.2 µg/Kg)

	Concentration µg/Kg DW							Concentration mg/Kg OC						
	A	B	C	D	E	LAET	2LAET	A	B	C	D	E	SQS	CSL
NFK501 (2 cm)	73.9	64.7	52.8	73.9	<MDL (92)	**	**	2.52	2.21	1.80	2.52	<MDL (3.1)	4.9	64
NFK501 (10 cm)	38.9	29.7	23.0	<MDL (46)	<MDL (92)	**	**	1.76	1.34	1.04	<MDL (2.1)	<MDL (4.2)	4.9	64
NFK502 (2 cm)	19.7	11	9.5	<MDL (46)	<MDL (92)	63	470	11.7	6.2	5.6	<MDL (27)	<MDL (54)	**	**
NFK502 (10 cm)	13	<MDL (6.9)	<MDL (6.9)	<MDL (46)	<MDL (92)	63	470	5.1	<MDL (2.7)	<MDL (2.7)	<MDL (18)	<MDL (36)	**	**
NFK503 (2 cm)	51.9	42.7	33.0	51.9	<MDL (92)	**	**	1.88	1.55	1.20	1.88	<MDL (3.3)	4.9	64
NFK503 (10 cm)	37.1	27.9	19	<MDL (46)	<MDL (92)	**	**	1.53	1.15	0.79	<MDL (1.9)	<MDL (3.8)	4.9	64
NFK504 (2 cm)	<MDL (7.1)	<MDL (7.1)	<MDL (7.1)	<MDL (46)	<MDL (92)	63	470	<MDL (3.1)	<MDL (3.1)	<MDL (3.1)	<MDL (20)	<MDL (40)	**	**
NFK504 (10 cm)	11	<MDL (7.1)	<MDL (7.1)	<MDL (46)	<MDL (92)	63	470	10	<MDL (6.5)	<MDL (6.5)	<MDL (42)	<MDL (84)	**	**

Bis(2-ethylhexyl) Phthalate (method blank concentration of 27.7 µg/Kg)

	Concentration µg/Kg DW							Concentration mg/Kg OC						
	A	B	C	D	E	LAET	2LAET	A	B	C	D	E	SQS	CSL
NFK501 (2 cm)	968	940	905	968	968	**	**	33.0	32.1	30.9	33.0	33.0	47	78
NFK501 (10 cm)	559	531	511	559	559	**	**	25.3	24.0	23.1	25.3	25.3	47	78
NFK502 (2 cm)	48.1	20	17.5	<MDL (140)	<MDL (280)	1,300	1,900	28.5	12	10.4	<MDL (83)	<MDL (166)	**	**
NFK502 (10 cm)	60.6	32.9	28.9	<MDL (140)	<MDL (280)	1,300	1,900	23.7	12.9	11.3	<MDL (55)	<MDL (109)	**	**
NFK503 (2 cm)	609	581	552	609	609	**	**	22.1	21.1	20.0	22.1	22.1	47	78
NFK503 (10 cm)	591	563	538	591	591	**	**	24.3	23.2	22.1	24.3	24.3	47	78
NFK504 (2 cm)	31.6	<MDL (7.9)	<MDL (7.9)	<MDL (140)	<MDL (280)	1,300	1,900	13.9	<MDL (3.5)	<MDL (3.5)	<MDL (61)	<MDL (120)	**	**
NFK504 (10 cm)	19.9	<MDL (7.9)	<MDL (7.9)	<MDL (140)	<MDL (280)	1,300	1,900	18.1	<MDL (7.2)	<MDL (7.2)	<MDL (130)	<MDL (250)	**	**

Di-N-butyl Phthalate (method blank concentration of 9.0 µg/Kg)

	Concentration µg/Kg DW							Concentration mg/Kg OC						
	A	B	C	D	E	LAET	2LAET	A	B	C	D	E	SQS	CSL
NFK501 (2 cm)	32.7	23.7	12	<MDL (45)	<MDL (90)	**	**	1.12	0.809	0.413	<MDL (1.5)	<MDL (3.1)	220	1,700
NFK501 (10 cm)	24.7	16	9.1	<MDL (45)	<MDL (90)	**	**	1.12	0.71	0.41	<MDL (2.0)	<MDL (4.1)	220	1,700
NFK502 (2 cm)	9.3	<MDL (5.5)	<MDL (5.5)	<MDL (45)	<MDL (90)	1,400	5,100	5.5	<MDL (3.3)	<MDL (3.3)	<MDL (27)	<MDL (53)	**	**
NFK502 (10 cm)	12.1	<MDL (5.7)	<MDL (5.7)	<MDL (45)	<MDL (90)	1,400	5,100	4.73	<MDL (2.2)	<MDL (2.2)	<MDL (18)	<MDL (35)	**	**
NFK503 (2 cm)	35.2	26.2	17	<MDL (45)	<MDL (90)	**	**	1.28	0.949	0.61	<MDL (1.6)	<MDL (3.3)	220	1,700
NFK503 (10 cm)	26.4	17	<MDL (9.7)	<MDL (45)	<MDL (90)	**	**	1.09	0.72	<MDL (0.40)	<MDL (1.9)	<MDL (3.7)	220	1,700
NFK504 (2 cm)	10	<MDL (5.9)	<MDL (5.9)	<MDL (45)	<MDL (90)	1,400	5,100	4.4	<MDL (2.6)	<MDL (2.6)	<MDL (20)	<MDL (39)	**	**
NFK504 (10 cm)	10	<MDL (5.9)	<MDL (5.9)	<MDL (45)	<MDL (90)	1,400	5,100	9.1	<MDL (5.4)	<MDL (5.4)	<MDL (41)	<MDL (82)	**	**

Notes

A - Concentration as reported with no correction for method blank concentration.
B - Method blank concentration subtracted from dry weight sample concentration (after normalization to dry weight).
C - Method blank concentration subtracted from wet weight sample concentration (prior to normalization to dry weight).
D - Method detection limit raised to five times the method blank concentration.
E - Method detection limit raised to ten times the method blank concentration.
µg/Kg DW - Micrograms per kilogram, based on percent solids analysis.
mg/Kg OC - Milligrams per kilogram organic carbon, based on total organic carbon analysis.

** - Sediment quality chemical criterion not applicable.
2 cm - Sample collected from the 0 to 2 centimeter depth stratum.
10 cm - Sample collected from the 0 to 10 centimeter depth stratum.
<MDL (#) - Analyte not detected above the *method detection limit*. Value in parentheses is the numeric MDL.
Shaded Cell - Normalized MDL exceeds a sediment chemical criterion.

APPENDIX A
COMPREHENSIVE ANALYTICAL RESULTS

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Four Sampling Event
April 2003

Locator:	NFK501	NFK501	NFK502	NFK502
Descrip:	Norfolk CSO Channel	Norfolk CSO Channel	Combined Channel Delta	Combined Channel Delta
Stratum:	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum
Sampled:	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003
Lab ID:	L28052-1	L28052-2	L28052-3	L28052-4
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	43.7	57.8	90.5	87.4

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis		
COMBINED LABS																				
M=CV ASTM D422																				
Clay *	6.7		0.1	0.1	%	3.7		0.1	0.1	%		<MDL	0.1	0.1	%		<MDL	0.1	0.1	%
Silt *	36		0.1	0.1	%	25.3		0.1	0.1	%	5.2		0.1	0.1	%	6.3		0.1	0.1	%
Sand *	56.4		0.1	0.1	%	69.8		0.1	0.1	%	92		0.1	0.1	%	91.8		0.1	0.1	%
Gravel *	1	E	0.1	0.1	%	1.2	E	0.1	0.1	%	2.9	E	0.1	0.1	%	1.7	E	0.1	0.1	%
p+0.00 *	2.1		0.1	0.1	%	2.6		0.1	0.1	%	26.4		0.1	0.1	%	16.6		0.1	0.1	%
p+1.00 *	22.2		0.1	0.1	%	23.2		0.1	0.1	%	50.2		0.1	0.1	%	50.3		0.1	0.1	%
p+10.0 *	1.1		0.1	0.1	%	0.4		0.1	0.1	%		<MDL	0.1	0.1	%		<MDL	0.1	0.1	%
p+10.0(more than) *	3.8		0.1	0.1	%	2.3		0.1	0.1	%		<MDL	0.1	0.1	%		<MDL	0.1	0.1	%
p+2.00 *	18.1		0.1	0.1	%	35.7		0.1	0.1	%	14		0.1	0.1	%	23.7		0.1	0.1	%
p+3.00 *	2.1		0.1	0.1	%	3.1		0.1	0.1	%	0.8		0.1	0.1	%	0.9		0.1	0.1	%
p+4.00 *	11.9		0.1	0.1	%	5.2		0.1	0.1	%	0.6		0.1	0.1	%	0.3		0.1	0.1	%
p+5.00 *	12.9		0.1	0.1	%	10.6		0.1	0.1	%	4.3		0.1	0.1	%	5.2		0.1	0.1	%
p+6.00 *	11		0.1	0.1	%	6		0.1	0.1	%	0.3		0.1	0.1	%		<MDL	0.1	0.1	%
p+7.00 *	8.3		0.1	0.1	%	4.7		0.1	0.1	%	0.6		0.1	0.1	%	0.9		0.1	0.1	%
p+8.00 *	3.8		0.1	0.1	%	4		0.1	0.1	%		<MDL	0.1	0.1	%	0.2		0.1	0.1	%
p+9.00 *	1.8		0.1	0.1	%	1		0.1	0.1	%		<MDL	0.1	0.1	%		<MDL	0.1	0.1	%
p-1.00 *	0.6		0.1	0.1	%	0.8		0.1	0.1	%	2.8		0.1	0.1	%	1.5		0.1	0.1	%
p-2.00 *	0.2		0.1	0.1	%	0.2		0.1	0.1	%	0.1	RDL	0.1	0.1	%	0.2		0.1	0.1	%
p-2.00(less than) *	0.2		0.1	0.1	%	0.2		0.1	0.1	%		<MDL	0.1	0.1	%		<MDL	0.1	0.1	%
M=CV EPA9060-PSEP96 (03-04-002-002)																				
Total Organic Carbon	29300		2100	4120	mg/Kg	22100		1900	3810	mg/Kg	1690		550	1100	mg/Kg	2560		570	1140	mg/Kg
M=CV SM2540-G (03-01-007-001)																				
Total Solids *	43.7		0.005	0.01	%	57.8		0.005	0.01	%	90.5		0.005	0.01	%	87.4		0.005	0.01	%
M=ES NONE																				
Sampcoordx1 *	1278585				ft	1278585				ft	1278512				ft	1278512				ft
Sampcoordx2 *	1278585				ft	1278585				ft	1278513				ft	1278513				ft
Sampcoordx3 *	1278587				ft	1278587				ft	1278509				ft	1278509				ft
Sampcoordy1 *	190168				ft	190168				ft	190161				ft	190161				ft
Sampcoordy2 *	190167				ft	190167				ft	190153				ft	190153				ft
Sampcoordy3 *	190166				ft	190166				ft	190155				ft	190155				ft
Sample Depth *	2				m	2				m	4				m	4				m
Sample Start Time *	1100				hr	1100				hr	1147				hr	1147				hr
Sediment Sampling Depth *	14				cm	14				cm	14				cm	14				cm
Sediment Sampling Range *	0-2 cm				none	0-10 cm				none	0-2 cm				none	0-10 cm				none
Tidal Condition	E				none	E				none	E				none	E				none
Tide Height *	8				ft	8				ft	7				ft	7				ft

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Four Sampling Event
April 2003

	NFK501 (0 to 2 cm)	NFK501 (0 to 10 cm)	NFK502 (0 to 2 cm)	NFK502 (0 to 10 cm)
Locator:	NFK501	NFK501	NFK502	NFK502
Descrip:	Norfolk CSO Channel	Norfolk CSO Channel	Combined Channel Delta	Combined Channel Delta
Stratum:	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum
Sampled:	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003
Lab ID:	L28052-1	L28052-2	L28052-3	L28052-4
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	43.7	57.8	90.5	87.4

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
M=MT EPA 245.5 (06-01-004-003)																				
Mercury, Total, CVAA	0.11	<RDL	0.03	0.293	mg/Kg	0.062	<RDL	0.024	0.24	mg/Kg		<MDL	0.022	0.221	mg/Kg		<MDL	0.023	0.23	mg/Kg
M=MT EPA3050A/6010B (06-02-004-002)																				
Aluminum, Total, ICP	14400	L	5.3	26.5	mg/Kg	10600	L	4.2	20.8	mg/Kg	9350	L	5.3	26.6	mg/Kg	8990	L	5.5	27.7	mg/Kg
Arsenic, Total, ICP	7.8	<RDL	2.7	13.3	mg/Kg	8.3	<RDL	2.1	10.4	mg/Kg	4.3	<RDL	2.7	13.3	mg/Kg	4.7	<RDL	2.7	13.8	mg/Kg
Beryllium, Total, ICP	0.368		0.053	0.265	mg/Kg	0.272		0.042	0.208	mg/Kg	0.22	<RDL	0.053	0.266	mg/Kg	0.19	<RDL	0.055	0.277	mg/Kg
Cadmium, Total, ICP	0.23	<RDL	0.16	0.799	mg/Kg	0.16	<RDL	0.12	0.625	mg/Kg		<MDL	0.15	0.799	mg/Kg		<MDL	0.17	0.832	mg/Kg
Chromium, Total, ICP	18		0.27	1.33	mg/Kg	14.1		0.21	1.04	mg/Kg	15.1		0.27	1.33	mg/Kg	12.1		0.27	1.38	mg/Kg
Copper, Total, ICP	30.9		0.21	1.07	mg/Kg	23.7		0.17	0.832	mg/Kg	13.7		0.21	1.07	mg/Kg	13.3		0.22	1.11	mg/Kg
Iron, Total, ICP	23800	G	2.7	13.3	mg/Kg	18200	G	2.1	10.4	mg/Kg	19600	G	2.7	13.3	mg/Kg	18900	G	2.7	13.8	mg/Kg
Lead, Total, ICP	222		1.6	7.99	mg/Kg	13		1.2	6.25	mg/Kg	3.5	<RDL	1.5	7.99	mg/Kg	4.2	<RDL	1.7	8.32	mg/Kg
Manganese, Total, ICP	325		0.11	0.533	mg/Kg	240		0.083	0.415	mg/Kg	270		0.11	0.533	mg/Kg	249		0.11	0.554	mg/Kg
Nickel, Total, ICP	16.7		1.1	5.33	mg/Kg	12.8		0.83	4.15	mg/Kg	18.1		1.1	5.33	mg/Kg	13.4		1.1	5.54	mg/Kg
Selenium, Total, ICP		<MDL	2.7	13.3	mg/Kg		<MDL	2.1	10.4	mg/Kg		<MDL	2.7	13.3	mg/Kg		<MDL	2.7	13.8	mg/Kg
Silver, Total, ICP		<MDL	0.21	1.07	mg/Kg		<MDL	0.17	0.832	mg/Kg		<MDL	0.21	1.07	mg/Kg		<MDL	0.22	1.11	mg/Kg
Thallium, Total, ICP		<MDL	11	53.3	mg/Kg		<MDL	8.3	41.5	mg/Kg		<MDL	11	53.3	mg/Kg		<MDL	11	55.4	mg/Kg
Zinc, Total, ICP	89.9		0.27	1.33	mg/Kg	67.8		0.21	1.04	mg/Kg	44.5		0.27	1.33	mg/Kg	44.2		0.27	1.38	mg/Kg
M=OR EPA 3550B/8270C (7-3-01-004)																				
1,2,4-Trichlorobenzene		<MDL	0.59	1.21	ug/Kg		<MDL	0.45	0.917	ug/Kg		<MDL	0.29	0.586	ug/Kg		<MDL	0.3	0.606	ug/Kg
1,2-Dichlorobenzene		<MDL	0.59	1.21	ug/Kg		<MDL	0.45	0.917	ug/Kg		<MDL	0.29	0.586	ug/Kg		<MDL	0.3	0.606	ug/Kg
1,2-Diphenylhydrazine		<MDL	23	45.8	ug/Kg		<MDL	17	34.6	ug/Kg		<MDL	11	22.1	ug/Kg		<MDL	11	22.9	ug/Kg
1,3-Dichlorobenzene		<MDL	0.59	1.21	ug/Kg		<MDL	0.45	0.917	ug/Kg		<MDL	0.29	0.586	ug/Kg		<MDL	0.3	0.606	ug/Kg
1,4-Dichlorobenzene	8.79		0.3	0.604	ug/Kg	6.73		0.22	0.457	ug/Kg	0.53		0.14	0.292	ug/Kg	0.549		0.15	0.302	ug/Kg
2,4,5-Trichlorophenol		<MDL	27	54.9	ug/Kg		<MDL	21	41.5	ug/Kg		<MDL	13	26.5	ug/Kg		<MDL	14	27.5	ug/Kg
2,4,6-Trichlorophenol		<MDL	30	59.5	ug/Kg		<MDL	22	45	ug/Kg		<MDL	14	28.7	ug/Kg		<MDL	15	29.7	ug/Kg
2,4-Dichlorophenol		<MDL	37	73.2	ug/Kg		<MDL	28	55.4	ug/Kg		<MDL	18	35.4	ug/Kg		<MDL	18	36.6	ug/Kg
2,4-Dimethylphenol		<MDL,X	16	32	ug/Kg		<MDL,X	12	24.2	ug/Kg		<MDL,X	7.7	15.5	ug/Kg		<MDL,X	8	16	ug/Kg
2,4-Dinitrophenol		<MDL	30	61.1	ug/Kg		<MDL	22	46.2	ug/Kg		<MDL	14	29.5	ug/Kg		<MDL	15	30.5	ug/Kg
2,4-Dinitrotoluene		<MDL	6.9	13.7	ug/Kg		<MDL	5.2	10.4	ug/Kg		<MDL	3.3	6.63	ug/Kg		<MDL	3.4	6.86	ug/Kg
2,6-Dinitrotoluene		<MDL	23	45.8	ug/Kg		<MDL	17	34.6	ug/Kg		<MDL	11	22.1	ug/Kg		<MDL	11	22.9	ug/Kg
2-Chloronaphthalene		<MDL	37	73.2	ug/Kg		<MDL	28	55.4	ug/Kg		<MDL	18	35.4	ug/Kg		<MDL	18	36.6	ug/Kg
2-Chlorophenol		<MDL	18	36.6	ug/Kg		<MDL	14	27.7	ug/Kg		<MDL	8.8	17.7	ug/Kg		<MDL	9.2	18.3	ug/Kg
2-Methylnaphthalene		<MDL	32	64.1	ug/Kg		<MDL	24	48.4	ug/Kg		<MDL	15	30.9	ug/Kg		<MDL	16	32	ug/Kg
2-Methylphenol		<MDL,G	43	87	ug/Kg		<MDL,G	33	65.7	ug/Kg		<MDL,G	21	42	ug/Kg		<MDL,G	22	43.5	ug/Kg
2-Nitroaniline		<MDL	30	61.1	ug/Kg		<MDL	22	46.2	ug/Kg		<MDL	14	29.5	ug/Kg		<MDL	15	30.5	ug/Kg
2-Nitrophenol		<MDL	34	68.6	ug/Kg		<MDL	26	51.9	ug/Kg		<MDL	17	33.1	ug/Kg		<MDL	17	34.3	ug/Kg
3,3'-Dichlorobenzidine		<MDL,X	30	61.1	ug/Kg		<MDL,X	22	46.2	ug/Kg		<MDL,X	14	29.5	ug/Kg		<MDL,X	15	30.5	ug/Kg

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Four Sampling Event
April 2003

Locator:	NFK501	NFK501	NFK502	NFK502
Descrip:	Norfolk CSO Channel	Norfolk CSO Channel	Combined Channel Delta	Combined Channel Delta
Stratum:	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum
Sampled:	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003
Lab ID:	L28052-1	L28052-2	L28052-3	L28052-4
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	43.7	57.8	90.5	87.4

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
3-Nitroaniline		<MDL,X	30	61.1	ug/Kg		<MDL,X	22	46.2	ug/Kg		<MDL,X	14	29.5	ug/Kg		<MDL,X	15	30.5	ug/Kg
4,6-Dinitro-O-Cresol		<MDL	30	61.1	ug/Kg		<MDL	22	46.2	ug/Kg		<MDL	14	29.5	ug/Kg		<MDL	15	30.5	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	21	41.2	ug/Kg		<MDL	16	31.1	ug/Kg		<MDL	9.9	19.9	ug/Kg		<MDL	10	20.6	ug/Kg
4-Chloro-3-Methylphenol		<MDL	30	61.1	ug/Kg		<MDL	22	46.2	ug/Kg		<MDL	14	29.5	ug/Kg		<MDL	15	30.5	ug/Kg
4-Chloroaniline		<MDL,X	6.2	12.2	ug/Kg		<MDL,X	4.7	9.22	ug/Kg		<MDL,X	3	5.89	ug/Kg		<MDL,X	3.1	6.1	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	30	59.5	ug/Kg		<MDL	22	45	ug/Kg		<MDL	14	28.7	ug/Kg		<MDL	15	29.7	ug/Kg
4-Methylphenol		<MDL,G	37	73.2	ug/Kg	55	RDL,G	28	55.4	ug/Kg		<MDL,G	18	35.4	ug/Kg		<MDL,G	18	36.6	ug/Kg
4-Nitroaniline		<MDL,G	30	61.1	ug/Kg		<MDL,G	22	46.2	ug/Kg		<MDL,G	14	29.5	ug/Kg		<MDL,G	15	30.5	ug/Kg
4-Nitrophenol		<MDL	30	61.1	ug/Kg		<MDL	22	46.2	ug/Kg		<MDL	14	29.5	ug/Kg		<MDL	15	30.5	ug/Kg
Acenaphthene	23	<RDL	16	32	ug/Kg	15	<RDL	12	24.2	ug/Kg		<MDL	7.7	15.5	ug/Kg		<MDL	8	16	ug/Kg
Acenaphthylene		<MDL	34	68.6	ug/Kg		<MDL	26	51.9	ug/Kg		<MDL	17	33.1	ug/Kg		<MDL	17	34.3	ug/Kg
Aniline		<MDL,X	300	611	ug/Kg		<MDL,X	220	462	ug/Kg		<MDL,X	140	295	ug/Kg		<MDL,X	150	305	ug/Kg
Anthracene	22.6	G	9.2	18.3	ug/Kg	14.9	G	6.9	13.8	ug/Kg		<MDL,G	4.4	8.84	ug/Kg		<MDL,G	4.6	9.15	ug/Kg
Benzo(a)anthracene	114	G	4.6	9.15	ug/Kg	76.8	G	3.5	6.92	ug/Kg	8.04	G	2.2	4.42	ug/Kg	19	G	2.3	4.58	ug/Kg
Benzo(a)pyrene	154	G	6.9	13.7	ug/Kg	101	G	5.2	10.4	ug/Kg	12	G	3.3	6.63	ug/Kg	16.4	G	3.4	6.86	ug/Kg
Benzo(b)fluoranthene	200		6.9	13.7	ug/Kg	140		5.2	10.4	ug/Kg	14.8		3.3	6.63	ug/Kg	19.1		3.4	6.86	ug/Kg
Benzo(g,h,i)perylene	135	G	18	36.6	ug/Kg	99.1	G	14	27.7	ug/Kg		<MDL,G	8.8	17.7	ug/Kg	10	<RDL,G	9.2	18.3	ug/Kg
Benzo(k)fluoranthene	196	L	6.9	13.7	ug/Kg	132	L	5.2	10.4	ug/Kg	12.3	L	3.3	6.63	ug/Kg	19	L	3.4	6.86	ug/Kg
Benzoic Acid	563		62	304	ug/Kg	210	<RDL	47	230	ug/Kg	40	<RDL	30	147	ug/Kg	38	<RDL	31	152	ug/Kg
Benzyl Alcohol		<MDL	14	27.5	ug/Kg		<MDL	10	20.8	ug/Kg		<MDL	6.6	13.3	ug/Kg		<MDL	6.9	13.7	ug/Kg
Benzyl Butyl Phthalate	73.9	B	14	27.5	ug/Kg	38.9	B	10	20.8	ug/Kg	19.7	B	6.6	13.3	ug/Kg	13	<RDL,B	6.9	13.7	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL	39	77.8	ug/Kg		<MDL	29	58.8	ug/Kg		<MDL	19	37.6	ug/Kg		<MDL	19	38.9	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL	34	68.6	ug/Kg		<MDL	26	51.9	ug/Kg		<MDL	17	33.1	ug/Kg		<MDL	17	34.3	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL	34	68.6	ug/Kg		<MDL	26	51.9	ug/Kg		<MDL	17	33.1	ug/Kg		<MDL	17	34.3	ug/Kg
Bis(2-Ethylhexyl)Phthalate	968	B	15	32	ug/Kg	559	B	12	24.2	ug/Kg	48.1	B	7.4	15.5	ug/Kg	60.6	B	7.7	16	ug/Kg
Caffeine		<MDL	14	27.5	ug/Kg		<MDL	10	20.8	ug/Kg		<MDL	6.6	13.3	ug/Kg		<MDL	6.9	13.7	ug/Kg
Carbazole	39.6		16	32	ug/Kg	25.4		12	24.2	ug/Kg		<MDL	7.7	15.5	ug/Kg		<MDL	8	16	ug/Kg
Chrysene	203	E	9.2	18.3	ug/Kg	140	E	6.9	13.8	ug/Kg	12.5	E	4.4	8.84	ug/Kg	33.8	E	4.6	9.15	ug/Kg
Coprostanol	799		32	64.1	ug/Kg	441		24	48.4	ug/Kg	24	<RDL	15	30.9	ug/Kg		<MDL	16	32	ug/Kg
Dibenzo(a,h)anthracene	37.8		16	32	ug/Kg	19	<RDL	12	24.2	ug/Kg		<MDL	7.7	15.5	ug/Kg		<MDL	8	16	ug/Kg
Dibenzofuran		<MDL	32	64.1	ug/Kg		<MDL	24	48.4	ug/Kg		<MDL	15	30.9	ug/Kg		<MDL	16	32	ug/Kg
Diethyl Phthalate		<MDL	14	27.5	ug/Kg		<MDL	10	20.8	ug/Kg		<MDL	6.6	13.3	ug/Kg		<MDL	6.9	13.7	ug/Kg
Dimethyl Phthalate		<MDL	25	50.3	ug/Kg		<MDL	19	38.1	ug/Kg		<MDL	12	24.3	ug/Kg		<MDL	13	25.2	ug/Kg
Di-N-Butyl Phthalate	32.7	B	11	22.9	ug/Kg	24.7	B	8.7	17.3	ug/Kg	9.3	<RDL,B	5.5	11	ug/Kg	12.1	B	5.7	11.4	ug/Kg
Di-N-Octyl Phthalate	146		18	36.6	ug/Kg		<MDL	14	27.7	ug/Kg		<MDL	8.8	17.7	ug/Kg		<MDL	9.2	18.3	ug/Kg
Fluoranthene	396	G	18	36.6	ug/Kg	253	G	14	27.7	ug/Kg	24.2	G	8.8	17.7	ug/Kg	43.4	G	9.2	18.3	ug/Kg
Fluorene		<MDL	30	59.5	ug/Kg		<MDL	22	45	ug/Kg		<MDL	14	28.7	ug/Kg		<MDL	15	29.7	ug/Kg

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Five-Year Monitoring Program
Year Four Sampling Event
April 2003

	NFK501 (0 to 2 cm)	NFK501 (0 to 10 cm)	NFK502 (0 to 2 cm)	NFK502 (0 to 10 cm)
Locator:	NFK501	NFK501	NFK502	NFK502
Descrip:	Norfolk CSO Channel	Norfolk CSO Channel	Combined Channel Delta	Combined Channel Delta
Stratum:	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum
Sampled:	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003
Lab ID:	L28052-1	L28052-2	L28052-3	L28052-4
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	43.7	57.8	90.5	87.4

Locator NFK501 — Lab ID L28052-1 (0 to 2 cm)

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
COMBINED LABS					
Hexachlorobenzene		<MDL	1.5	3.04	ug/Kg
Hexachlorobutadiene		<MDL	1.7	3.43	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	62	304	ug/Kg
Hexachloroethane		<MDL	34	68.6	ug/Kg
Indeno(1,2,3-Cd)Pyrene	119	G	21	41.2	ug/Kg
Isophorone		<MDL	43	87	ug/Kg
Naphthalene		<MDL,G	32	64.1	ug/Kg
Nitrobenzene		<MDL	37	73.2	ug/Kg
N-Nitrosodimethylamine		<MDL	300	611	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	21	41.2	ug/Kg
N-Nitrosodiphenylamine		<MDL	46	91.5	ug/Kg
Pentachlorophenol		<MDL	11	22.9	ug/Kg
Phenanthrene	189	G	9.2	18.3	ug/Kg
Phenol	75.7		21	41.2	ug/Kg
Pyrene	284	G	9.2	18.3	ug/Kg
M=OR EPA 8081A/8082 (7-3-03-002)					
Aroclor 1016		<MDL	4.6	9.15	ug/Kg
Aroclor 1221		<MDL	9.2	18.3	ug/Kg
Aroclor 1232		<MDL	9.2	18.3	ug/Kg
Aroclor 1242		<MDL	4.6	9.15	ug/Kg
Aroclor 1248	66.8		4.6	9.15	ug/Kg
Aroclor 1254	58.6		4.6	9.15	ug/Kg
Aroclor 1260		<MDL	4.6	9.15	ug/Kg

Locator NFK501 — Lab ID L28052-2 (0 to 10 cm)

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
COMBINED LABS					
Hexachlorobenzene		<MDL	1.1	2.3	ug/Kg
Hexachlorobutadiene		<MDL	1.3	2.6	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	47	230	ug/Kg
Hexachloroethane		<MDL	26	51.9	ug/Kg
Indeno(1,2,3-Cd)Pyrene	81.3	G	16	31.1	ug/Kg
Isophorone		<MDL	33	65.7	ug/Kg
Naphthalene		<MDL,G	24	48.4	ug/Kg
Nitrobenzene		<MDL	28	55.4	ug/Kg
N-Nitrosodimethylamine		<MDL	220	462	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	16	31.1	ug/Kg
N-Nitrosodiphenylamine		<MDL	35	69.2	ug/Kg
Pentachlorophenol		<MDL	8.7	17.3	ug/Kg
Phenanthrene	116	G	6.9	13.8	ug/Kg
Phenol	28	<RDL	16	31.1	ug/Kg
Pyrene	235	G	6.9	13.8	ug/Kg
M=OR EPA 8081A/8082 (7-3-03-002)					
Aroclor 1016		<MDL	3.5	6.92	ug/Kg
Aroclor 1221		<MDL	6.9	13.8	ug/Kg
Aroclor 1232		<MDL	6.9	13.8	ug/Kg
Aroclor 1242		<MDL	3.5	6.92	ug/Kg
Aroclor 1248	44.8		3.5	6.92	ug/Kg
Aroclor 1254	45		3.5	6.92	ug/Kg
Aroclor 1260		<MDL	3.5	6.92	ug/Kg

Locator NFK502 — Lab ID L28052-3 (0 to 2 cm)

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
COMBINED LABS					
Hexachlorobenzene		<MDL	0.73	1.47	ug/Kg
Hexachlorobutadiene		<MDL	0.83	1.66	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	30	147	ug/Kg
Hexachloroethane		<MDL	17	33.1	ug/Kg
Indeno(1,2,3-Cd)Pyrene		<MDL,G	9.9	19.9	ug/Kg
Isophorone		<MDL	21	42	ug/Kg
Naphthalene		<MDL,G	15	30.9	ug/Kg
Nitrobenzene		<MDL	18	35.4	ug/Kg
N-Nitrosodimethylamine		<MDL	140	295	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	9.9	19.9	ug/Kg
N-Nitrosodiphenylamine		<MDL	22	44.2	ug/Kg
Pentachlorophenol		<MDL	5.5	11	ug/Kg
Phenanthrene	9.14	G	4.4	8.84	ug/Kg
Phenol		<MDL	9.9	19.9	ug/Kg
Pyrene	21.5	G	4.4	8.84	ug/Kg
M=OR EPA 8081A/8082 (7-3-03-002)					
Aroclor 1016		<MDL	2.2	4.42	ug/Kg
Aroclor 1221		<MDL	4.4	8.84	ug/Kg
Aroclor 1232		<MDL	4.4	8.84	ug/Kg
Aroclor 1242		<MDL	2.2	4.42	ug/Kg
Aroclor 1248		<MDL	2.2	4.42	ug/Kg
Aroclor 1254		<MDL	2.2	4.42	ug/Kg
Aroclor 1260		<MDL	2.2	4.42	ug/Kg

Locator NFK502 — Lab ID L28052-4 (0 to 10 cm)

Parameters	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis			
COMBINED LABS					
Hexachlorobenzene		<MDL	0.76	1.52	ug/Kg
Hexachlorobutadiene		<MDL	0.86	1.72	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	31	152	ug/Kg
Hexachloroethane		<MDL	17	34.3	ug/Kg
Indeno(1,2,3-Cd)Pyrene		<MDL,G	10	20.6	ug/Kg
Isophorone		<MDL	22	43.5	ug/Kg
Naphthalene		<MDL,G	16	32	ug/Kg
Nitrobenzene		<MDL	18	36.6	ug/Kg
N-Nitrosodimethylamine		<MDL	150	305	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	10	20.6	ug/Kg
N-Nitrosodiphenylamine		<MDL	23	45.8	ug/Kg
Pentachlorophenol		<MDL	5.7	11.4	ug/Kg
Phenanthrene	21.2	G	4.6	9.15	ug/Kg
Phenol		<MDL	10	20.6	ug/Kg
Pyrene	39.7	G	4.6	9.15	ug/Kg
M=OR EPA 8081A/8082 (7-3-03-002)					
Aroclor 1016		<MDL	2.3	4.58	ug/Kg
Aroclor 1221		<MDL	4.6	9.15	ug/Kg
Aroclor 1232		<MDL	4.6	9.15	ug/Kg
Aroclor 1242		<MDL	2.3	4.58	ug/Kg
Aroclor 1248	13.4		2.3	4.58	ug/Kg
Aroclor 1254	7.56		2.3	4.58	ug/Kg
Aroclor 1260		<MDL	2.3	4.58	ug/Kg

* Not converted to dry weight basis for this parameter

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Norfolk CSO Sediment Remediation
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April 2003

Locator:	NFK503	NFK503	NFK504	NFK504
Descrip:	Boeing SD Channel	Boeing SD Channel	Upriver Reference	Upriver Reference
Stratum:	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum
Sampled:	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003
Lab ID:	L28052-5	L28052-6	L28052-7	L28052-8
Matrix:	SALTWTRSED	SALTWTRSED.	SALTWTRSED	SALTWTRSED
% Solids:	48.6	51.8	84.5	84.8

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
			- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis		
COMBINED LABS																				
M=CV ASTM D422																				
Clay *	6.1		0.1	0.1	%	5.5		0.1	0.1	%		<MDL	0.1	0.1	%		<MDL	0.1	0.1	%
Silt *	52.6		0.1	0.1	%	38.7		0.1	0.1	%	4.1		0.1	0.1	%	2.5		0.1	0.1	%
Sand *	40.3		0.1	0.1	%	55		0.1	0.1	%	93.5		0.1	0.1	%	94.3		0.1	0.1	%
Gravel *	0.8	E	0.1	0.1	%	1	E	0.1	0.1	%	2.4	E	0.1	0.1	%	3.1	E	0.1	0.1	%
p+0.00 *	0.8		0.1	0.1	%	0.8		0.1	0.1	%	21.8		0.1	0.1	%	14.5		0.1	0.1	%
p+1.00 *	1.6		0.1	0.1	%	4.7		0.1	0.1	%	41		0.1	0.1	%	41.1		0.1	0.1	%
p+10.0 *	0.5		0.1	0.1	%	1.5		0.1	0.1	%		<MDL	0.1	0.1	%		<MDL	0.1	0.1	%
p+10.0(more than) *	3.9		0.1	0.1	%	1.4		0.1	0.1	%		<MDL	0.1	0.1	%		<MDL	0.1	0.1	%
p+2.00 *	1.6		0.1	0.1	%	8.8		0.1	0.1	%	24.2		0.1	0.1	%	35.3		0.1	0.1	%
p+3.00 *	7.8		0.1	0.1	%	18		0.1	0.1	%	4.8		0.1	0.1	%	2.8		0.1	0.1	%
p+4.00 *	28.5		0.1	0.1	%	22.7		0.1	0.1	%	1.7		0.1	0.1	%	0.6		0.1	0.1	%
p+5.00 *	22.7		0.1	0.1	%	15		0.1	0.1	%	2.4		0.1	0.1	%	2		0.1	0.1	%
p+6.00 *	11.8		0.1	0.1	%	9.6		0.1	0.1	%	1.1		0.1	0.1	%	0.4		0.1	0.1	%
p+7.00 *	11.2		0.1	0.1	%	8.7		0.1	0.1	%	0.3		0.1	0.1	%	0.1	RDL	0.1	0.1	%
p+8.00 *	6.9		0.1	0.1	%	5.4		0.1	0.1	%	0.3		0.1	0.1	%		<MDL	0.1	0.1	%
p+9.00 *	1.7		0.1	0.1	%	2.6		0.1	0.1	%		<MDL	0.1	0.1	%		<MDL	0.1	0.1	%
p-1.00 *	0.2		0.1	0.1	%	0.4		0.1	0.1	%	2.4		0.1	0.1	%	2.5		0.1	0.1	%
p-2.00 *	0.4		0.1	0.1	%	0.4		0.1	0.1	%		<MDL	0.1	0.1	%	0.2		0.1	0.1	%
p-2.00(less than) *	0.2		0.1	0.1	%	0.2		0.1	0.1	%		<MDL	0.1	0.1	%	0.4		0.1	0.1	%
M=CV EPA9060-PSEP96 (03-04-002-002)																				
Total Organic Carbon	27600		2100	4120	mg/Kg	24300		2300	4630	mg/Kg	2280		590	1180	mg/Kg	1100	<RDL	590	1180	mg/Kg
M=CV SM2540-G (03-01-007-001)																				
Total Solids *	48.6		0.005	0.01	%	51.8		0.005	0.01	%	84.5		0.005	0.01	%	84.8		0.005	0.01	%
M=ES NONE																				
Sampcoordx1 *	1278545				ft	1278545				ft	1278622				ft	1278622				ft
Sampcoordx2 *	1278543				ft	1278543				ft	1278622				ft	1278622				ft
Sampcoordx3 *	1278540				ft	1278540				ft										
Sampcoordy1 *	190193				ft	190193				ft	190076				ft	190076				ft
Sampcoordy2 *	190198				ft	190198				ft	190076				ft	190076				ft
Sampcoordy3 *	190200				ft	190200				ft										
Sample Depth *	2				m	2				m	3				m	3				m
Sample Start Time *	1010				hr	1010				hr	1220				hr	1220				hr
Sediment Sampling Depth *	11				cm	11				cm	14				cm	14				cm
Sediment Sampling Range *	0-2 cm				none	0-10 cm				none	0-2 cm				none	0-10 cm				none
Tidal Condition	S				none	S				none	E				none	E				none
Tide Height *	8.7				ft	8.7				ft	6.5				ft	6.5				ft

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Four Sampling Event
April 2003

	Sample 1	Sample 2	Sample 3	Sample 4
Locator:	NFK503	NFK503	NFK504	NFK504
Descrip:	Boeing SD Channel	Boeing SD Channel	Upriver Reference	Upriver Reference
Stratum:	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum
Sampled:	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003
Lab ID:	L28052-5	L28052-6	L28052-7	L28052-8
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	48.6	51.8	84.5	84.8

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
M=MT EPA 245.5 (06-01-004-003)																				
Mercury, Total, CVAA	0.091	<RDL	0.031	0.3	mg/Kg	0.073	<RDL	0.035	0.338	mg/Kg		<MDL	0.022	0.225	mg/Kg		<MDL	0.024	0.239	mg/Kg
M=MT EPA3050A/6010B (06-02-004-002)																				
Aluminum, Total, ICP	18700	L	7.8	38.7	mg/Kg	21400	L	8.5	42.9	mg/Kg	8760	L	5.8	28.9	mg/Kg	7700	L	5.7	28.2	mg/Kg
Arsenic, Total, ICP	10	<RDL	3.9	19.4	mg/Kg	14	<RDL	4.2	21.4	mg/Kg	5.6	<RDL	2.8	14.4	mg/Kg	4.8	<RDL	2.8	14.2	mg/Kg
Beryllium, Total, ICP	0.477		0.078	0.387	mg/Kg	0.527		0.085	0.429	mg/Kg	0.22	<RDL	0.058	0.289	mg/Kg	0.18	<RDL	0.057	0.282	mg/Kg
Cadmium, Total, ICP	0.23	<RDL	0.23	1.16	mg/Kg	0.31	<RDL	0.25	1.29	mg/Kg		<MDL	0.18	0.865	mg/Kg		<MDL	0.17	0.847	mg/Kg
Chromium, Total, ICP	22.2		0.39	1.94	mg/Kg	25.9		0.42	2.14	mg/Kg	12.3		0.28	1.44	mg/Kg	9.86		0.28	1.42	mg/Kg
Copper, Total, ICP	33.5		0.31	1.55	mg/Kg	38		0.35	1.71	mg/Kg	13.5		0.22	1.15	mg/Kg	11.3		0.22	1.13	mg/Kg
Iron, Total, ICP	24900	G	3.9	19.4	mg/Kg	29900	G	4.2	21.4	mg/Kg	19200	G	2.8	14.4	mg/Kg	17600	G	2.8	14.2	mg/Kg
Lead, Total, ICP	15.2		2.3	11.6	mg/Kg	17.2		2.5	12.9	mg/Kg	5.4	<RDL	1.8	8.65	mg/Kg	4.2	<RDL	1.7	8.47	mg/Kg
Manganese, Total, ICP	669		0.15	0.774	mg/Kg	649		0.17	0.857	mg/Kg	269		0.11	0.576	mg/Kg	241		0.11	0.564	mg/Kg
Nickel, Total, ICP	20.1		1.5	7.74	mg/Kg	23		1.7	8.57	mg/Kg	12.7		1.1	5.76	mg/Kg	10.6		1.1	5.64	mg/Kg
Selenium, Total, ICP		<MDL	3.9	19.4	mg/Kg		<MDL	4.2	21.4	mg/Kg		<MDL	2.8	14.4	mg/Kg		<MDL	2.8	14.2	mg/Kg
Silver, Total, ICP		<MDL	0.31	1.55	mg/Kg		<MDL	0.35	1.71	mg/Kg		<MDL	0.22	1.15	mg/Kg		<MDL	0.22	1.13	mg/Kg
Thallium, Total, ICP		<MDL	15	77.4	mg/Kg		<MDL	17	85.7	mg/Kg		<MDL	11	57.6	mg/Kg		<MDL	11	56.4	mg/Kg
Zinc, Total, ICP	77.2		0.39	1.94	mg/Kg	93.6		0.42	2.14	mg/Kg	43.3		0.28	1.44	mg/Kg	40.8		0.28	1.42	mg/Kg
M=OR EPA 3550B/8270C (7-3-01-004)																				
1,2,4-Trichlorobenzene		<MDL	0.53	1.09	ug/Kg		<MDL	0.5	1.02	ug/Kg		<MDL	0.31	0.627	ug/Kg		<MDL	0.31	0.625	ug/Kg
1,2-Dichlorobenzene		<MDL	0.53	1.09	ug/Kg		<MDL	0.5	1.02	ug/Kg		<MDL	0.31	0.627	ug/Kg		<MDL	0.31	0.625	ug/Kg
1,2-Diphenylhydrazine		<MDL	21	41.2	ug/Kg		<MDL	19	38.6	ug/Kg		<MDL	12	23.7	ug/Kg		<MDL	12	23.6	ug/Kg
1,3-Dichlorobenzene		<MDL	0.53	1.09	ug/Kg		<MDL	0.5	1.02	ug/Kg		<MDL	0.31	0.627	ug/Kg		<MDL	0.31	0.625	ug/Kg
1,4-Dichlorobenzene	3.68		0.27	0.543	ug/Kg	1.85		0.25	0.51	ug/Kg		<MDL	0.15	0.312	ug/Kg		<MDL	0.15	0.311	ug/Kg
2,4,5-Trichlorophenol		<MDL	25	49.4	ug/Kg		<MDL	23	46.3	ug/Kg		<MDL	14	28.4	ug/Kg		<MDL	14	28.3	ug/Kg
2,4,6-Trichlorophenol		<MDL	27	53.5	ug/Kg		<MDL	25	50.2	ug/Kg		<MDL	15	30.8	ug/Kg		<MDL	15	30.7	ug/Kg
2,4-Dichlorophenol		<MDL	33	65.8	ug/Kg		<MDL	31	61.8	ug/Kg		<MDL	19	37.9	ug/Kg		<MDL	19	37.7	ug/Kg
2,4-Dimethylphenol		<MDL,X	14	28.8	ug/Kg		<MDL,X	14	27	ug/Kg		<MDL,X	8.3	16.6	ug/Kg		<MDL,X	8.3	16.5	ug/Kg
2,4-Dinitrophenol		<MDL	27	54.9	ug/Kg		<MDL	25	51.5	ug/Kg		<MDL	15	31.6	ug/Kg		<MDL	15	31.5	ug/Kg
2,4-Dinitrotoluene		<MDL	6.2	12.3	ug/Kg		<MDL	5.8	11.6	ug/Kg		<MDL	3.6	7.1	ug/Kg		<MDL	3.5	7.08	ug/Kg
2,6-Dinitrotoluene		<MDL	21	41.2	ug/Kg		<MDL	19	38.6	ug/Kg		<MDL	12	23.7	ug/Kg		<MDL	12	23.6	ug/Kg
2-Chloronaphthalene		<MDL	33	65.8	ug/Kg		<MDL	31	61.8	ug/Kg		<MDL	19	37.9	ug/Kg		<MDL	19	37.7	ug/Kg
2-Chlorophenol		<MDL	16	32.9	ug/Kg		<MDL	15	30.9	ug/Kg		<MDL	9.5	18.9	ug/Kg		<MDL	9.4	18.9	ug/Kg
2-Methylnaphthalene		<MDL	29	57.6	ug/Kg		<MDL	27	54.1	ug/Kg		<MDL	17	33.1	ug/Kg		<MDL	17	33	ug/Kg
2-Methylphenol		<MDL,G	39	78.2	ug/Kg		<MDL,G	37	73.4	ug/Kg		<MDL,G	22	45	ug/Kg		<MDL,G	22	44.8	ug/Kg
2-Nitroaniline		<MDL	27	54.9	ug/Kg		<MDL	25	51.5	ug/Kg		<MDL	15	31.6	ug/Kg		<MDL	15	31.5	ug/Kg
2-Nitrophenol		<MDL	31	61.7	ug/Kg		<MDL	29	57.9	ug/Kg		<MDL	18	35.5	ug/Kg		<MDL	18	35.4	ug/Kg
3,3'-Dichlorobenzidine		<MDL,X	27	54.9	ug/Kg		<MDL,X	25	51.5	ug/Kg		<MDL,X	15	31.6	ug/Kg		<MDL,X	15	31.5	ug/Kg

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Four Sampling Event
April 2003

Locator:	NFK503	NFK503	NFK504	NFK504
Descrip:	Boeing SD Channel	Boeing SD Channel	Upriver Reference	Upriver Reference
Stratum:	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum
Sampled:	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003
Lab ID:	L28052-5	L28052-6	L28052-7	L28052-8
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	48.6	51.8	84.5	84.8

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
3-Nitroaniline		<MDL,X	27	54.9	ug/Kg		<MDL,X	25	51.5	ug/Kg		<MDL,X	15	31.6	ug/Kg		<MDL,X	15	31.5	ug/Kg
4,6-Dinitro-O-Cresol		<MDL	27	54.9	ug/Kg		<MDL	25	51.5	ug/Kg		<MDL	15	31.6	ug/Kg		<MDL	15	31.5	ug/Kg
4-Bromophenyl Phenyl Ether		<MDL	19	37	ug/Kg		<MDL	17	34.7	ug/Kg		<MDL	11	21.3	ug/Kg		<MDL	11	21.2	ug/Kg
4-Chloro-3-Methylphenol		<MDL	27	54.9	ug/Kg		<MDL	25	51.5	ug/Kg		<MDL	15	31.6	ug/Kg		<MDL	15	31.5	ug/Kg
4-Chloroaniline		<MDL,X	5.6	11	ug/Kg		<MDL,X	5.2	10.3	ug/Kg		<MDL,X	3.2	6.31	ug/Kg		<MDL,X	3.2	6.29	ug/Kg
4-Chlorophenyl Phenyl Ether		<MDL	27	53.5	ug/Kg		<MDL	25	50.2	ug/Kg		<MDL	15	30.8	ug/Kg		<MDL	15	30.7	ug/Kg
4-Methylphenol	112	G	33	65.8	ug/Kg		<MDL,G	31	61.8	ug/Kg		<MDL,G	19	37.9	ug/Kg		<MDL,G	19	37.7	ug/Kg
4-Nitroaniline		<MDL,G	27	54.9	ug/Kg		<MDL,G	25	51.5	ug/Kg		<MDL,G	15	31.6	ug/Kg		<MDL,G	15	31.5	ug/Kg
4-Nitrophenol		<MDL	27	54.9	ug/Kg		<MDL	25	51.5	ug/Kg		<MDL	15	31.6	ug/Kg		<MDL	15	31.5	ug/Kg
Acenaphthene		<MDL	14	28.8	ug/Kg		<MDL	14	27	ug/Kg		<MDL	8.3	16.6	ug/Kg		<MDL	8.3	16.5	ug/Kg
Acenaphthylene		<MDL	31	61.7	ug/Kg		<MDL	29	57.9	ug/Kg		<MDL	18	35.5	ug/Kg		<MDL	18	35.4	ug/Kg
Aniline		<MDL,X	270	549	ug/Kg		<MDL,X	250	515	ug/Kg		<MDL,X	150	316	ug/Kg		<MDL,X	150	315	ug/Kg
Anthracene	14	<RDL,G	8.2	16.5	ug/Kg	15	<RDL,G	7.7	15.4	ug/Kg		<MDL,G	4.7	9.47	ug/Kg		<MDL,G	4.7	9.43	ug/Kg
Benzo(a)anthracene	68.7	G	4.1	8.23	ug/Kg	77	G	3.9	7.72	ug/Kg	4.6	<RDL,G	2.4	4.73	ug/Kg	5.98	G	2.4	4.72	ug/Kg
Benzo(a)pyrene	89.3	G	6.2	12.3	ug/Kg	99.2	G	5.8	11.6	ug/Kg	4.4	<RDL,G	3.6	7.1	ug/Kg	7.32	G	3.5	7.08	ug/Kg
Benzo(b)fluoranthene	118		6.2	12.3	ug/Kg	130		5.8	11.6	ug/Kg	8.93		3.6	7.1	ug/Kg	9.21		3.5	7.08	ug/Kg
Benzo(g,h,i)perylene	77.4	G	16	32.9	ug/Kg	79.9	G	15	30.9	ug/Kg		<MDL,G	9.5	18.9	ug/Kg		<MDL,G	9.4	18.9	ug/Kg
Benzo(k)fluoranthene	107	L	6.2	12.3	ug/Kg	107	L	5.8	11.6	ug/Kg	6.4	<RDL,L	3.6	7.1	ug/Kg	8.02	L	3.5	7.08	ug/Kg
Benzoic Acid	250	<RDL	56	274	ug/Kg	180	<RDL	52	257	ug/Kg	46	<RDL	32	157	ug/Kg	38	<RDL	32	157	ug/Kg
Benzyl Alcohol		<MDL	12	24.7	ug/Kg		<MDL	12	23.2	ug/Kg		<MDL	7.1	14.2	ug/Kg		<MDL	7.1	14.2	ug/Kg
Benzyl Butyl Phthalate	51.9	B	12	24.7	ug/Kg	37.1	B	12	23.2	ug/Kg		<MDL,B	7.1	14.2	ug/Kg	11	<RDL,B	7.1	14.2	ug/Kg
Bis(2-Chloroethoxy)Methane		<MDL	35	70	ug/Kg		<MDL	33	65.6	ug/Kg		<MDL	20	40.2	ug/Kg		<MDL	20	40.1	ug/Kg
Bis(2-Chloroethyl)Ether		<MDL	31	61.7	ug/Kg		<MDL	29	57.9	ug/Kg		<MDL	18	35.5	ug/Kg		<MDL	18	35.4	ug/Kg
Bis(2-Chloroisopropyl)Ether		<MDL	31	61.7	ug/Kg		<MDL	29	57.9	ug/Kg		<MDL	18	35.5	ug/Kg		<MDL	18	35.4	ug/Kg
Bis(2-Ethylhexyl)Phthalate	609	B	14	28.8	ug/Kg	591	B	13	27	ug/Kg	31.6	B	7.9	16.6	ug/Kg	19.9	B	7.9	16.5	ug/Kg
Caffeine		<MDL	12	24.7	ug/Kg		<MDL	12	23.2	ug/Kg		<MDL	7.1	14.2	ug/Kg		<MDL	7.1	14.2	ug/Kg
Carbazole	23	<RDL	14	28.8	ug/Kg	23	<RDL	14	27	ug/Kg		<MDL	8.3	16.6	ug/Kg		<MDL	8.3	16.5	ug/Kg
Chrysene	115	E	8.2	16.5	ug/Kg	126	E	7.7	15.4	ug/Kg	8.4	<RDL,E	4.7	9.47	ug/Kg	7.3	<RDL,E	4.7	9.43	ug/Kg
Coprostanol	280		29	57.6	ug/Kg	189		27	54.1	ug/Kg		<MDL	17	33.1	ug/Kg		<MDL	17	33	ug/Kg
Dibenzo(a,h)anthracene	15	<RDL	14	28.8	ug/Kg	19	<RDL	14	27	ug/Kg		<MDL	8.3	16.6	ug/Kg		<MDL	8.3	16.5	ug/Kg
Dibenzofuran		<MDL	29	57.6	ug/Kg		<MDL	27	54.1	ug/Kg		<MDL	17	33.1	ug/Kg		<MDL	17	33	ug/Kg
Diethyl Phthalate		<MDL	12	24.7	ug/Kg		<MDL	12	23.2	ug/Kg		<MDL	7.1	14.2	ug/Kg		<MDL	7.1	14.2	ug/Kg
Dimethyl Phthalate		<MDL	23	45.3	ug/Kg		<MDL	21	42.5	ug/Kg		<MDL	13	26	ug/Kg		<MDL	13	25.9	ug/Kg
Di-N-Butyl Phthalate	35.2	B	10	20.6	ug/Kg	26.4	B	9.7	19.3	ug/Kg	10	<RDL,B	5.9	11.8	ug/Kg	10	<RDL,B	5.9	11.8	ug/Kg
Di-N-Octyl Phthalate		<MDL	16	32.9	ug/Kg		<MDL	15	30.9	ug/Kg		<MDL	9.5	18.9	ug/Kg		<MDL	9.4	18.9	ug/Kg
Fluoranthene	216	G	16	32.9	ug/Kg	249	G	15	30.9	ug/Kg	32.4	G	9.5	18.9	ug/Kg	15	<RDL,G	9.4	18.9	ug/Kg
Fluorene		<MDL	27	53.5	ug/Kg		<MDL	25	50.2	ug/Kg		<MDL	15	30.8	ug/Kg		<MDL	15	30.7	ug/Kg

King County Environmental Lab Analytical Report

Norfolk CSO Sediment Remediation
Five-Year Monitoring Program
Year Four Sampling Event
April 2003

	Sample 1	Sample 2	Sample 3	Sample 4
Locator:	NFK503	NFK503	NFK504	NFK504
Descrip:	Boeing SD Channel	Boeing SD Channel	Upriver Reference	Upriver Reference
Stratum:	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum	0 to 2 cm Depth Stratum	0 to 10 cm Depth Stratum
Sampled:	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003	Apr 23, 2003
Lab ID:	L28052-5	L28052-6	L28052-7	L28052-8
Matrix:	SALTWTRSED	SALTWTRSED	SALTWTRSED	SALTWTRSED
% Solids:	48.6	51.8	84.5	84.8

Parameters	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units	Value	Qual	MDL	RDL	Units
		- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis					- Dry Weight Basis			
COMBINED LABS																				
Hexachlorobenzene		<MDL	1.4	2.74	ug/Kg	2.5	<RDL	1.3	2.57	ug/Kg		<MDL	0.78	1.57	ug/Kg		<MDL	0.78	1.57	ug/Kg
Hexachlorobutadiene		<MDL	1.5	3.09	ug/Kg		<MDL	1.4	2.9	ug/Kg		<MDL	0.89	1.78	ug/Kg		<MDL	0.88	1.77	ug/Kg
Hexachlorocyclopentadiene		<MDL,G	56	274	ug/Kg		<MDL,G	52	257	ug/Kg		<MDL,G	32	157	ug/Kg		<MDL,G	32	157	ug/Kg
Hexachloroethane		<MDL	31	61.7	ug/Kg		<MDL	29	57.9	ug/Kg		<MDL	18	35.5	ug/Kg		<MDL	18	35.4	ug/Kg
Indeno(1,2,3-Cd)Pyrene	63.2	G	19	37	ug/Kg	66.8	G	17	34.7	ug/Kg		<MDL,G	11	21.3	ug/Kg		<MDL,G	11	21.2	ug/Kg
Isophorone		<MDL	39	78.2	ug/Kg		<MDL	37	73.4	ug/Kg		<MDL	22	45	ug/Kg		<MDL	22	44.8	ug/Kg
Naphthalene		<MDL,G	29	57.6	ug/Kg		<MDL,G	27	54.1	ug/Kg		<MDL,G	17	33.1	ug/Kg		<MDL,G	17	33	ug/Kg
Nitrobenzene		<MDL	33	65.8	ug/Kg		<MDL	31	61.8	ug/Kg		<MDL	19	37.9	ug/Kg		<MDL	19	37.7	ug/Kg
N-Nitrosodimethylamine		<MDL	270	549	ug/Kg		<MDL	250	515	ug/Kg		<MDL	150	316	ug/Kg		<MDL	150	315	ug/Kg
N-Nitrosodi-N-Propylamine		<MDL	19	37	ug/Kg		<MDL	17	34.7	ug/Kg		<MDL	11	21.3	ug/Kg		<MDL	11	21.2	ug/Kg
N-Nitrosodiphenylamine		<MDL	41	82.3	ug/Kg		<MDL	39	77.2	ug/Kg		<MDL	24	47.3	ug/Kg		<MDL	24	47.2	ug/Kg
Pentachlorophenol		<MDL	10	20.6	ug/Kg		<MDL	9.7	19.3	ug/Kg		<MDL	5.9	11.8	ug/Kg		<MDL	5.9	11.8	ug/Kg
Phenanthrene	103	G	8.2	16.5	ug/Kg	109	G	7.7	15.4	ug/Kg	30.1	G	4.7	9.47	ug/Kg	5.5	<RDL,G	4.7	9.43	ug/Kg
Phenol	33	<RDL	19	37	ug/Kg		<MDL	17	34.7	ug/Kg		<MDL	11	21.3	ug/Kg		<MDL	11	21.2	ug/Kg
Pyrene	190	G	8.2	16.5	ug/Kg	214	G	7.7	15.4	ug/Kg	24.9	G	4.7	9.47	ug/Kg	15.1	G	4.7	9.43	ug/Kg
M=OR EPA 8081A/8082 (7-3-03-002)																				
Aroclor 1016		<MDL	4.1	8.23	ug/Kg		<MDL	7.7	15.4	ug/Kg		<MDL	2.4	4.73	ug/Kg		<MDL	2.4	4.72	ug/Kg
Aroclor 1221		<MDL	8.2	16.5	ug/Kg		<MDL	15	30.9	ug/Kg		<MDL	4.7	9.47	ug/Kg		<MDL	4.7	9.43	ug/Kg
Aroclor 1232		<MDL	8.2	16.5	ug/Kg		<MDL	15	30.9	ug/Kg		<MDL	4.7	9.47	ug/Kg		<MDL	4.7	9.43	ug/Kg
Aroclor 1242		<MDL	4.1	8.23	ug/Kg		<MDL	7.7	15.4	ug/Kg		<MDL	2.4	4.73	ug/Kg		<MDL	2.4	4.72	ug/Kg
Aroclor 1248	68.3		4.1	8.23	ug/Kg	108		7.7	15.4	ug/Kg		<MDL	2.4	4.73	ug/Kg		<MDL	2.4	4.72	ug/Kg
Aroclor 1254	45.7		4.1	8.23	ug/Kg	84.6		7.7	15.4	ug/Kg		<MDL	2.4	4.73	ug/Kg		<MDL	2.4	4.72	ug/Kg
Aroclor 1260		<MDL	4.1	8.23	ug/Kg		<MDL	7.7	15.4	ug/Kg		<MDL	2.4	4.73	ug/Kg		<MDL	2.4	4.72	ug/Kg

* Not converted to dry weight basis for this parameter

APPENDIX B
QUALITY ASSURANCE REVIEW

KING COUNTY ENVIRONMENTAL LABORATORY
QUALITY ASSURANCE REVIEW

for

ESTUARINE SEDIMENT ANALYTICAL DATA

NORFOLK CSO SEDIMENT REMEDIATION PROJECT
FIVE-YEAR MONITORING PROGRAM
APRIL 2003 SAMPLING EVENT

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July 23, 2003

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INTRODUCTION

This quality assurance (QA) narrative is intended to document the QA review conducted on the chemistry analyses performed for the Norfolk CSO Sediment Remediation Study. The QA narrative is organized into the five sections listed below.

- General Comments
- Sample Collection
- Conventional Analyses
- Metal Chemistry
- Organic Chemistry

An overview of the approach used for the QA review is detailed in the *General Comments* section. Additional information specific to each analysis is included in the appropriate analytical section.

This QA review and narrative (specifically defined as QA1) have been conducted in accordance with guidelines established through the Puget Sound Dredged Disposal Analysis (PSDDA) program and the Sediment Management Standards (WAC 173-204-610). Other approaches incorporated in the QA review have been established through collaboration between the King County Environmental Laboratory (KC Laboratory) and the Washington State Department of Ecology (Ecology) Sediment Management Unit.

GENERAL COMMENTS

Scope of Samples Submitted
This QA review is associated with estuarine sediment samples collected in April 23, 2003 as part of the Norfolk CSO Sediment Remediation Study.

Except where noted in the subcontracting sections of this QA review, all analyses have been conducted by the King County Environmental Laboratory (KCEL). Sediment analytical data are reported with associated data qualifiers and have undergone QA1 review, as summarized in this narrative report.

Completeness
Completeness has been evaluated for this data submission and QA review by considering the following criteria:

- Comparing reported data to the planned project analyses summarized in Table 1.
- Compliance with storage conditions and holding times.
- Frequency of analysis of the complete set of quality control (QC) samples outlined in Table 2.

Subcontracted Analyses
Analyses that have been subcontracted and the issues associated with these subcontracted analyses are noted in this narrative.

Methods
Analytical methods are noted in the applicable analytical sections of this QA review.

Target Lists
The reported target lists have been compared to the target analytes listed in *Table 1 - Marine Sediment Quality Standards Chemical Criteria* and *Table 3 - Puget Sound Marine Sediment Cleanup Screening Levels Chemical Criteria* contained in Chapter 173-204 WAC.

Detection Limits
The KC Laboratory distinguishes between the reporting detection limit (RDL) and the method detection limit (MDL).

- The RDL is defined as *the minimum concentration of a chemical constituent that can be reliably quantified.*
- The MDL is defined as *the minimum concentration of a chemical constituent that can be detected.*

Some subcontracted laboratory data are available with an MDL only, in accordance with the subcontracting laboratory policies. All analytical parameters are reported with detection limit(s). For some methods the detection limits reported may vary from sample to sample depending on the amount of sample analyzed and any additional dilutions required.

Storage Conditions and Holding Times
Storage conditions and holding times have been evaluated using guidelines established during the Third Annual PSDDA Review Meeting. The approach used to evaluate Total Organic Carbon for holding time has been established between the KC Laboratory and Ecology during previous QA1 review efforts. Extraction and analysis holding times for each method are summarized in each analytical section.

Method Blanks
Method blank results have been used to evaluate the possible laboratory contamination of samples. Method blank results have been reviewed for the presence of analytes detected at or greater than the MDL.

Standard Reference Materials
Standard reference material (SRM) recoveries have been used to evaluate possible low or high analytical bias on a batch-specific basis. SRM analysis is included with metals and selected organic and conventional parameters (see Table 2). SRMs are purchased from the National Institute of Standards and Technology (NIST) or National Research Council of Canada (NRCC) and have certified analyte values. Lab Control Samples (or spiked blanks) may also be analyzed by the analytical laboratory as part of overall quality control but the results are not used to qualify the sample data.

Matrix Spikes
Matrix spike recoveries have been used to evaluate possible low or high analytical bias on a matrix and batch-specific basis. Matrix spikes are analyzed with metals, organics and selected conventionals parameters (see Table 2).

Laboratory Replicate Samples
Replicate analysis (laboratory duplicates or triplicates) is used as an indicator of method precision and is used to qualify data on an analyte and batch-specific basis. Not all replicate data are used, however, as an indicator for data qualification. Only sets of replicate results which include at least one result greater than the RDL are considered for data qualification. These guidelines have been used to account for the fact that precision obtained near the detection limit is not representative of precision obtained throughout the entire analytical range.

Surrogates
Surrogate recoveries have been used to evaluate possible low or high analytical bias on a sample-specific basis. Surrogates are only analyzed for organic parameters.

Data Qualifiers
The data qualification system used for this data submission is presented in Table 3. These data qualifiers address situations that require qualification and generally conform to QA1 guidance. Changes made to SRM data qualification have been discussed with and approved by the Sediment Management Unit of Ecology. The qualifiers shown in Table 3 are also used for the Sedqual electronic data format (except for <MDL and <RDL).

Units and Significant Figures
Data have been reported in accordance with laboratory policy at the time of data generation. Data generally have been reported to three significant figures if above the RDL and two significant figures if equal to or below the RDL.

SAMPLE COLLECTION

This section describes sampling activities associated with the collection of 8 composite sediment samples on April 23, 2003. All sampling activities were conducted following guidance suggested in the Puget Sound Estuarine Protocols (PSEP, 1996 and 1998).

Sampling Locations and Station Positioning

Sampling locations (stations) were selected and the prescribed coordinates determined prior to field activities. Stations were selected to match the historical sampling locations for this on-going monitoring project. The prescribed station coordinates are presented in the following table. Also presented in the table are the actual coordinates recorded during sampling activities. All station coordinates are recorded in state plane coordinate system North American Datum 1983 (NAD83).

Lab ID #	Station Name	Prescribed Northing	Field Northing	Prescribed Easting	Field Easting
L28052-1, -2	NFK501	190170	190168	1278584	1278585
			190167		1278585
			190166		1278587
L28052-3, -4	NFK502	190159	190161	1278514	1278512
			190153		1278513
			190155		1278509
L28052-5, -6	NFK503	190195	190193	1278544	1278545
			190198		1278543
			190200		1278540
L28052-7, -8	NFK504	190080	190076	1278625	1278622
			190076		1278622
	Third cast not collected				

Sediment grab samples were collected from the King County research vessel *Chinook*, which is equipped with a differential global positioning system (DGPS). Field coordinates were recorded using DGPS for each acceptable deployment of the grab sampler as it contacted the sediment. Coordinates for each grab sampler deployment are included in the previous table.

The average coordinates for the sampler deployments are within 6 meters (19 feet) of the prescribed coordinates.

Sample Description Table

Lab Sample #	Locator	Sample Collection	Sediment Depth used for Composite (from surface)	Sample Usage
L28052-1	NFK501	Surface Grabs	2 cm	Chemistry
L28052-2	NFK501	Surface Grabs	10 cm	Chemistry
L28052-3	NFK502	Surface Grabs	2 cm	Chemistry
L28052-4	NFK502	Surface Grabs	10 cm	Chemistry
L28052-5	NFK503	Surface Grabs	2 cm	Chemistry
L28052-6	NFK503	Surface Grabs	10 cm	Chemistry
L28052-7	NFK504	Surface Grabs	2 cm	Chemistry
L28052-8	NFK504	Surface Grabs	10 cm	Chemistry

Sample Collection and Handling

Eight composite samples in total were collected April 23, 2003 from the Norfolk Sediment Cap Monitoring Project site using a stainless steel, modified, 0.1 m^2 dual Van Veen grab sampler deployed from the *Chinook* via hydrowire. For each deployment, samples were collected from both the top 2 cm and top 10 cm of sediment, each from separate Van Veen samplers. Water depth at the four stations ranged between 1 to 2 meters (not corrected for tide). The depth of the grab deployments from the sediment surface ranged from 11 to 14 cm.

Samples were comprised of sediment aliquots collected from three individual grabs at each station with approximately an equal amount of material collected from each grab. The top 2cm samples were collected using a 200 cm2 "cookie cutter" and stainless steel spatula. The 10cm samples were collected using a stainless steel spoon. Both 2cm and 10cm aliquots were taken from each Van Veen cast by sampling each fraction (2cm or 10cm) from a different side of the Van Veen sampler. Each of the aliquots were placed into a separate stainless-steel bowl, covered with foil between grab deployments. After collecting aliquots from three grabs, the sediment sample was thoroughly homogenized and sample aliquots split out into pre-labeled containers. Sample containers were supplied by the King County Environmental Laboratory and were pre-cleaned according to analytical specifications.

Individual sets of sample compositing equipment were dedicated to each station precluding the need for decontamination of the field gear. The Van Veen grab sampler was decontaminated between stations by scrubbing with a brush and ambient water followed by a thorough *in situ* rinsing.

Samples were stored in ice-filled coolers from the time of collection until delivery to the King County Environmental Laboratory. Samples were delivered under chain-of-custody and were maintained as such throughout the analytical process. Samples were stored frozen (-18°C) by the laboratory until analysis with the exception of samples for particle size distribution (PSD) analysis. PSD samples were stored refrigerated at approximately 4°C. A more complete description of sample handling and storage can be found in each analytical chemistry section of this narrative.

CONVENTIONAL ANALYSES

Completeness
Conventional data are reported for all samples and parameters summarized in Table 1. These samples were analyzed in association with the complete set of QC samples outlined in Table 2.

Subcontracted Analyses
Analysis for PSD was subcontracted to AmTest, Inc. in Redmond, Washington.

Methods
PSD analysis was performed in accordance with ASTM and Puget Sound Protocols methodologies (*Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound* - page 9 - PSEP, 1986). TOC analysis was performed in accordance with SM5310-B. Total solids analysis were performed in accordance with SM2540-B.

Detection Limits, Units and Significant Figures
For analyses performed at the KC Laboratory, data are reported in accordance with laboratory policy at the time the data were generated. Data are reported to three significant figures for results greater than the RDL and two significant figures for results equal to or less than the RDL. For results reported with less than two or three significant figures, significant zeroes are implied. This may not apply to subcontracted data.

Storage Conditions and Holding Times
Sample storage conditions and holding times have been evaluated using guidelines established during the Third Annual PSDDA Review Meeting. The dates and holding time criteria for the actual storage conditions used for conventional analyses are listed in the table below.

Parameter	Lab ID#	Date Collected	Date Extracted*	Date Analyzed	Sample Holding Time	Extract Holding Time
Particle Size Distribution	L28052-1 to –8	23-Apr-2003	NA	01-May-2003	6 Months at 4°C	NA
Total Solids	L28052-1 to -8	23-Apr-2003	NA	05-May-2003	6 months at -18°C	NA
Total Organic Carbon	L28052-1 to –4, -7, -8	23-Apr-2003	05-May-2003	13-May-2003	6 months at -18°C	6 months at -18°C
	L28052-5, -6	23-Apr-2003	05-May-2003	14-May-2003		

* Sample preparation start date for TOC

Sample storage conditions and holding times were met for all samples in this data submission.

Method Blanks
Method blanks were analyzed in connection with solids and total organic carbon analyses. All method blanks results were less than the MDL.

Standard Reference Materials
An SRM (Buffalo River Sediment) was analyzed in connection with TOC analysis. The percent recovery for the SRM analysis was within the 80 to 120% QC limits.

Matrix Spikes
The selected analytical methods run on these samples do not require matrix spikes.

Laboratory Replicate Samples

Laboratory triplicate samples were analyzed for all conventional parameters. The percent relative standard deviations (%RSD) for all triplicate analyses were less than or equal to the 20% QC limit with the exception of PSD.

The %RSD for the gravel portion of the PSD measurement is greater than 20%. These categories represent less than 10% of the total particle distribution of the sample. Higher variability is expected for categories that represent 10% of less of the total mass. The results have been flagged with an "E" qualifier.

Sample L28052-5 was analyzed for TOTS in duplicate and not in triplicate as per SAP. The relative percent difference (RPD) of the sample and its duplicate was 0%. Based on the excellent precision between the sample and its duplicate, it will be unlikely that a third aliquot would yield a percent relative standard deviation (%RSD) outside the control limit of 20%. However, when the discrepancy was discovered during the preparation of the narrative in July, three fresh aliquots of the same sample were re analyzed to confirm the original results. The July results are in good agreement with the original reported data and the %RSD is less than 1%. The original data is reported without qualification and the second data set for L28052-5 is used as confirmation.

METALS CHEMISTRY

Completeness
Metal chemistry data are reported for all samples and parameters summarized in Table 1. These samples were analyzed for mercury and other metals in association with the complete set of QC samples outlined in Table 2.

Subcontracted Analyses
There were no subcontracted metals analyses for these samples.

Methods
Mercury analysis was performed in accordance with EPA Method 7471. Analysis for other metals was performed in accordance with EPA Methods 3050/6010.

Target List
The reported target list includes all metals specified in Table 1.

Detection Limits, Units and Significant Figures
For analyses performed at the KC Laboratory, data are reported in accordance with laboratory policy at the time the data were generated. Data are reported to three significant figures for results greater than the RDL and two significant figures for results equal to or less than the RDL. For results reported with less than two or three significant figures, significant zeroes are implied. This may not apply to subcontracted data.

Storage Conditions and Holding Times
Sample storage conditions and holding times have been evaluated using guidelines established during the Third Annual PSDDA Review Meeting. The dates and holding time criteria for the actual storage conditions used for metals analyses are listed in the table below.

Parameter	Lab ID#	Date Collected	Date Digested/ Extracted	Date Analyzed	Sample Holding Time	Digestate/Extract Holding Time
Total Metals	L28052-1 through 8	4/23/03	6/05/03	6/06/03	2 Years at -18°C	6 months
Total Mercury	L28052-1 through 8	4/23/03	5/7/03	5/8/03	28 days at -18°C	NA

Sample storage conditions and holding times were met for all samples in this data submission.

Method Blanks
All metals method blanks results were less than the MDL

Standard Reference Materials
The SRM analyzed in association with samples included in this data submission is Buffalo River Sediment. This SRM is not certified for Silver, Aluminum, Beryllium, Iron or Thallium. An SRM recovery less than the QC limit of 80% for ICP metals has not been used to qualify data because the digestion technique used for ICP analysis is different from the technique used during analysis to determine the SRM values. Only SRM recoveries greater than 120% will be used to qualify ICP data.

All total ICP metals SRM recoveries were less than the QC limit of 120%. All total mercury SRM recoveries were within the QC limits of 80-120%.

Matrix Spikes
All matrix spike recoveries were within the 75 to 125% QC limits with the following exceptions.

For samples L28052-1 to 8: Aluminum recovery of 165% was outside of the acceptable range. Aluminum results were qualified with an "L" flag. Iron recovery of 22% was outside of the acceptable range. Iron results were qualified with an "G" flag.

Laboratory Replicate Samples
The relative percent differences (RPDs) for laboratory duplicate results for all metals were less than or equal to the QC limit of 20%.

ORGANIC CHEMISTRY

Completeness
Organics data are reported for all samples and parameters summarized in Table 1. These samples were analyzed in association with the complete set of QC samples outlined in Table 2.

Methods
BNA analysis was performed in accordance with EPA method 8270. PCB analysis was performed in accordance with EPA methods 8082.

Target List
The reported BNA target list includes all compounds specified in *Table 1 - Marine Sediment Quality Standards Chemical Criteria* and *Table 3 - Puget Sound Marine Sediment Cleanup Screening Levels Chemical Criteria* contained in Chapter 173-204 WAC with the exception of benzo(j)fluoranthene. The KC Laboratory has verified that analytical conditions are sufficient to calculate a total benzofluoranthene result using the reported *b* and *k* isomers.

Reported PCB data include Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

Detection Limits, Units and Significant Figures
For analyses performed at the KC Laboratory, data are reported in accordance with laboratory policy at the time the data were generated. Data are reported to three significant figures for results greater than the RDL and two significant figures for results equal to or less than the RDL. For results reported with less than two or three significant figures, significant zeroes are implied.

Storage Conditions and Holding Times
Sample storage conditions and holding times have been evaluated using guidelines established during the Third Annual PSDDA Review Meeting. The dates and holding time criteria for the actual storage conditions used for conventional analyses are listed in the table below.

Parameter	Lab ID#	Date Collected	Date Extracted	Date Analyzed	Sample Holding Time	Extract Holding Time
BNAs	L28052-1 to -8	4/23/03	5/21/03	5/22/03	1 year at -18°C	40 days at 4°C
PCBs	L28052-1 to -8	4/23/02	4/29/03	6/2/03	1 year at -18°C	40 days at 4°C

Sample storage conditions and holding times were met for all samples in this data submission.

Method Blanks

1. BNAs

The method blank analyzed with BNAs for L28052 had results above the MDL for Butyl Benzyl Phthalate, Bis(2-Ethylhexyl) Phthalate and Di-N-butyl Phthalate. Sample results for Butyl Benzyl Phthalate, Bis(2-Ethylhexyl) Phthalate and Di-N- Butyl Phthalate for that batch (L28052) have been qualified with the B flag. All Butyl Benzyl Phthalate, Bis(2-Ethylhexyl) Phthalate and Di-N-Butyl Phthalate results for these samples must be treated as estimated values.

All other method blank results (PCBs) were less than the MDL.

Surrogate Recoveries

1. BNA
BNA sample data are qualified when the average surrogate recovery for either or both the acid and base/neutral fractions are outside the 50 to 150% QC limits. All average surrogate recoveries (acid and base neutral) were within the acceptable recovery range for all surrogate compounds.

2. PCB
PCB sample data are qualified when both surrogate recoveries are outside QC limits. At least one PCB surrogate recovery was within the 50 to 150% QC limits for all samples in this data submission.

Standard Reference Materials

1. BNA
The sediment SRM analyzed in association with the reported BNA results is SRM 1944a, certified by the National Institute of Standards and Technology (NIST). Only a partial list of BNA parameters have certified values in SRM 1944a and therefore only those are used to qualify the data. Results for this partial list of compounds for the one batch of samples have been qualified based on the SRM recoveries outside the 80 to 120% QC limits. The recoveries and flags are summarized in the following table.

	L28052-1 to 8	
Compound	**% Recovery**	**Flag**
Naphthalene	14	G
Phenanthrene	66	G
Anthracene	39	G
Fluoranthene	74	G
Pyrene	77	G
Benzo(a)anthracene	76	G
Chrysene	82	
Benzo(b)fluoranthene	83	
Benzo(k)fluoranthene	133	L
Benzo(a)pyrene	70	G
Indeno(1,2,3-c,d)pyrene	61	G
Dibenzo(a,h)anthracene	115	
Benzo(g,h,i)perylene	69	G

2. PCB
The sediment SRM analyzed in association with the reported PCB results is HS-2, certified by the National Research Council of Canada. SRM HS-2 has a certified value for Aroclor 1254. The recovery of the certified parameters must be within 80 to 120% or the appropriate data are flagged. The SRM results for the batch of analyses is summarized below:

	L28052-1 to 8	
Compound	**% Recovery**	**Flag**
Aroclor 1254	110	

Matrix Spikes

1. BNA

The matrix spike recoveries for each BNA compound must be within the 50 to 150% QC limits. If not, all results for those particular compounds within the batch of samples must be flagged as follows. A G flag is applied if the recovery is between 10 and 50%, an X flag is applied if less than 10% recovery and an L flag is applied if greater than 150% recovery. The following table summarizes the matrix spike recoveries for specific compounds that are outside the QC limits and the appropriate flag.

	L28052-1 to 8	
Compound	**% Recovery**	*Flag*
2,4-Dimethylphenol	4	X
Hexachlorocyclopentadiene	33	G
3, 3'-Dichlorobenzidine	3	X
Aniline	0	X
2-Methylphenol	42	G
4-Methylphenol	45	G
4-Chloroaniline	0	X
3-Nitroaniline	8	X
4-Nitroaniline	25	G

2. PCB

The matrix spike recoveries for PCB compounds must be within the 50 to 150% QC limits. A G flag is applied if the recovery is between 10 and 50%, an X flag is applied if less than 10% recovery and an L flag is applied if greater than 150% recovery. Aroclor 1260 and 1016 only are used as the spiking compounds for PCB analysis.

All PCB matrix spike recoveries are within the QC limits.

Laboratory Replicate Samples

Lab Replicate (duplicate) samples for Organics have a target acceptance limit 100% for the Relative Percent Difference (RPD). All duplicate analyses showed acceptable RPD values except for the following:

1. BNAs

   No RPD limits were exceeded for the compounds reported with the exception of Chrysene which had an RPD of 107%.

2. PCBs

   No RPD limits were exceeded for the compounds reported.

TABLE 1
SEDIMENT SAMPLE INVENTORY

Sample	Locator / Description (see SAP)	PSD	Solids	TOC	Metals[1]	BNA[2]	PCB	Comments
L28052-1	NFK501/Norfolk CSO channel, 0-2 cm	X	X	X	X	X	X	
L28052-2	NFK501/Norfolk CSO channel, 0-10 cm	X	X	X	X	X	X	
L28052-3	NFK502/Delta of CSO channel, 0-2 cm	X	X	X	X	X	X	
L28052-4	NFK502/Delta of CSO channel, o0-10 cm	X	X	X	X	X	X	
L28052-5	NFK503/Boeing SD channel, 0-2 cm	X	X	X	X	X	X	
L28052-6	NFK503/Boeing SD channel, 0-10 cm	X	X	X	X	X	X	
L28052-7	NFK504/Upriver of CSO, 0-2 cm	X	X	X	X	X	X	
L28052-8	NFK504/Upriver of CSO, 0-10 cm	X	X	X	X	X	X	

1 Metals = Hg, Al, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, Tl, Zn, Fe
2 BNA = includes Chlorobenzenes

TABLE 2
QC SAMPLE FREQUENCY FOR SEDIMENT CHEMICAL AND PHYSICAL PARAMETERS

Parameter	Method Blank	Duplicate	Triplicate	Matrix Spike	SRM	Surrogates
PSD	No	10% of samples	10% of samples	No	No	No
Total Solids	1 per QC batch	5% minimum, 1 per QC batch	5% minimum, 1 per QC batch	No	No	No
TOC	1 per QC batch	5% minimum, 1 per QC batch	5% minimum, 1 per QC batch	No	1 per QC batch	No
Metals	1 per QC batch	5% minimum, 1 per QC batch	No	5% minimum, 1 per QC batch	1 per QC batch	No
BNA (w/ Chlorobenzenes)	1 per QC batch	5% minimum, 1 per QC batch	No	5% minimum, 1 per QC batch	1 per QC batch	Yes
PCB	1 per QC batch	5% minimum, 1 per QC batch	No	5% minimum, 1 per QC batch	1 per QC batch	Yes

TABLE 3 - SUMMARY OF SEDIMENT DATA QUALIFIERS

Condition to Qualify	Flag	Organic QC Limits	Metal QC Limits	Conventional QC Limits	Comment
Very low matrix spike recovery	X	< 10 %	< 10 %	< 10 %	
low matrix spike recovery	G	< 50%	< 75%	< 75% *	
High matrix spike recovery	L	> 150%	>125%	>125% *	
low standard reference material recovery	G	< 80%	NA	< 80%	
High standard reference material recovery	L	>120%	>120%	>120%	
High duplicate relative percent difference	E	>100 %	>20%	NA	for organics and metals
High triplicate relative standard deviation	E	NA	NA	> 20 %	for conventionals
less than the reporting detection limit	<RDL **	NA	NA	NA	
less than the method detection limit	<MDL **	NA	NA	NA	
Contamination reported in blank	B	>MDL	>MDL	>MDL	
Biased data based on very low surrogate recoveries	X	all fraction surrogates <10%	NA	NA	average surrogate recovery for BNA
Biased data based on low surrogate recoveries	G	all fraction surrogates <50%	NA	NA	average surrogate recovery for BNA
Biased data based on high surrogate recoveries	L	all fraction surrogates >150%	NA	NA	average surrogate recovery for BNA
Rejected - unusable for all purposes	R	NA	NA	NA	
a sample handling criteria has not been met	H	NA	NA	NA	container, hold time, preservation

65% to 135% for Total Sulfides.

** For Sedqual files, <MDL uses a "U" flag, <RDL is not flagged.

Login Number: P28052

NORFOLK 5-YEAR MONITORING, 1999 ON

Project Number: 423056-160

Personnel: _____

Sample Number	P28052-1	P28052-2	P28052-3
Locator	NFK501	NFK501	NFK502
Short Loc. Desc.	NFK501	NFK501	NFK502
Locator Desc.	NORFOLK CSO CHANNEL PRIOR TO CONFL	NORFOLK CSO CHANNEL PRIOR TO CONFL	DELTA OF CSO CHANNEL AFTER CONFLUE
Site	DUWAMISH RIVER	DUWAMISH RIVER	DUWAMISH RIVER
Sample Depth	2	→	4
Collect Date	23 Apr 03	→	→
Comments	3 - 1/2 Grab Composite, 0 - 2 cm	3 - 1/2 Grab Composite, 0 - 10 cm	3 - 1/2 Grab Composite, 0 - 2 cm
SAMP METH			
SED DEPTH	13 16 / 14	→	16 15 / 14
SED SAMP RANGE	0-2 cm	0-10 cm	0-2 cm
SED TYPE	3 2 W 16	→	3 (N) 21
TIDE COND	5	→	→
TIDE HT	8	8	9
TIME	1100	→	1147
Dept., Matrix, Prod	3 SALTWTRSED PSD	3 SALTWTRSED PSD	3 SALTWTRSED PSD
	3 SALTWTRSED TOC	3 SALTWTRSED TOC	3 SALTWTRSED TOC
	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS
	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP
	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP
	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP
	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP
	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP
	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP
	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP
	6 SALTWTRSED FE-ICP	6 SALTWTRSED FE-ICP	6 SALTWTRSED FE-ICP
	6 SALTWTRSED HG-CVAA	6 SALTWTRSED HG-CVAA	6 SALTWTRSED HG-CVAA
	6 SALTWTRSED MN-ICP	6 SALTWTRSED MN-ICP	6 SALTWTRSED MN-ICP
	6 SALTWTRSED NI-ICP	6 SALTWTRSED NI-ICP	6 SALTWTRSED NI-ICP

Initial / Date

Coords continue ...

Oil sheen on 2nd grab.

S. Plan: NFK MONITORING

Login #: L

WSLP #: WG 68883 WG 68882

Chain of Custody #: A/M 5-19-03 A/M 5-15-03

Relinquished by: Judith Ochs 4/23/03

Print Name: Judith Ochs Time: 1547

Received by: Melinda S. Kangale 23 Apr 03

Print Name: M. Kangale Time: 1547

Sample Number(s): L28052 1-8

(All)

NORFOLK 5-YEAR MONITORING, 1999 ON

Project Number: 423056-160

Personnel: _____

Sample Number	P28052-4	P28052-5	P28052-6
Locator	NFK502	NFK503	NFK503
Short Loc. Desc.	NFK502	NFK503	NFK503
Locator Desc.	DELTA OF CSO CHANNEL AFTER CONFLUE	BOEING SD CHANNEL PRIOR TO CONFLUE	BOEING SD CHANNEL PRIOR TO CONFLUE
Site	DUWAMISH RIVER	DUWAMISH RIVER	DUWAMISH RIVER
Sample Depth	4	2	→
Collect Date	23 Apr. 03	23 Apr 03	→
Comments	3 - 1/2 Grab Composite, 0 - 10 cm	3 - 1/2 Grab Composite, 0 - 2 cm	3 - 1/2 Grab Composite, 0 - 10 cm
SAMP METH			
SED DEPTH	16 15 14	10 11	→
SED SAMP RANGE	0-10 cm	0-2 cm	0-10 cm
SED TYPE	31 N 21	23 N 40	→
TIDE COND	E	S	→
TIDE HT	7	8.7	→
TIME	1147	1010	→
Dept., Matrix, Prod	3 SALTWTRSED PSD	3 SALTWTRSED PSD	3 SALTWTRSED PSD
	3 SALTWTRSED TOC	3 SALTWTRSED TOC	3 SALTWTRSED TOC
	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS
	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP
	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP
	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP
	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP
	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP
	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP
	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP
	6 SALTWTRSED FE-ICP	6 SALTWTRSED FE-ICP	6 SALTWTRSED FE-ICP
	6 SALTWTRSED HG-CVAA	6 SALTWTRSED HG-CVAA	6 SALTWTRSED HG-CVAA
	6 SALTWTRSED MN-ICP	6 SALTWTRSED MN-ICP	6 SALTWTRSED MN-ICP
	6 SALTWTRSED NI-ICP	6 SALTWTRSED NI-ICP	6 SALTWTRSED NI-ICP

continue ...

NORFOLK 5-YEAR MONITORING, 1999 ON

Project Number: 423056-160 Personnel: _____

Sample Number	P28052-7	P28052-8	
Locator	NFK504	NFK504	
Short Loc. Desc.	NFK504	NFK504	
Locator Desc.	UPRIVER OF CSO AND STORM DRAIN CHA	UPRIVER OF CSO AND STORM DRAIN CHA	
Site	DUWAMISH RIVER	DUWAMISH RIVER	
Sample Depth	3	3	
Collect Date	23 Apr 03	→	
Comments	3 - 1/2 Grab Composite, 0 - 2 cm	3 - 1/2 Grab Composite, 0 - 10 cm	
SAMP METH			
SED DEPTH	14 13 14	14 13 14	
SED SAMP RANGE	0-2cm	0-10cm	
SED TYPE	32 N 21	→	
TIDE COND	E	→	
TIDE HT	6.5	→	
TIME	1220	→	
Dept., Matrix, Prod			
	3 SALTWTRSED PSD	3 SALTWTRSED PSD	
	3 SALTWTRSED TOC	3 SALTWTRSED TOC	
	3 SALTWTRSED TOTS	3 SALTWTRSED TOTS	
	6 SALTWTRSED AG-ICP	6 SALTWTRSED AG-ICP	
	6 SALTWTRSED AL-ICP	6 SALTWTRSED AL-ICP	
	6 SALTWTRSED AS-ICP	6 SALTWTRSED AS-ICP	
	6 SALTWTRSED BE-ICP	6 SALTWTRSED BE-ICP	
	6 SALTWTRSED CD-ICP	6 SALTWTRSED CD-ICP	
	6 SALTWTRSED CR-ICP	6 SALTWTRSED CR-ICP	
	6 SALTWTRSED CU-ICP	6 SALTWTRSED CU-ICP	
	6 SALTWTRSED FE-ICP	6 SALTWTRSED FE-ICP	
	6 SALTWTRSED HG-CVAA	6 SALTWTRSED HG-CVAA	
	6 SALTWTRSED MN-ICP	6 SALTWTRSED MN-ICP	
	6 SALTWTRSED NI-ICP	6 SALTWTRSED NI-ICP	

continue ...

CHAIN OF CUSTODY

RELINQUISHED BY		RECEIVED BY	
Signature Judith Ochs	Date 4/23/03	Signature	Date
Printed Name JUDITH OCHS	Time 1547	Printed Name	Time
Sample Number(s) L28052-1-8	(All)	Sample Number(s)	(All)

LABORATORY WORK ORDER
Chain of Custody

King County Department of Natural Resources
Water and Land Resources Division
Environmental Laboratory
322 West Ewing Street
Seattle, Washington 98119-1507

Project Name: Norfolk Sediments
Project Number: 423056-160
Laboratory Project Manager: Fritz Grothkopp/John Blaine
Telephone Number: 684 2327/2384

Note: Use only one Login No. per sheet. Sample Number	Client Locator	Collect Date	Collect Time	Analyses: TOC/TOTS	PSD *	BNALL/PCB	Metals -ICP/HG-CVAA	Number of Containers	Comments
L 28052- 1	NFK501	4-23-03		1	1	1	1	4	Refrigerate PCBs.
L - 2	" 502								Freeze all other samples.
L - 3	" 503								
L - 4	" 504								
L - 5	" 503								
L - 6	" 503								
L - 7	" 504								
L - 8	" 504								
L -									
L -									
L -									

Additional Comments:

* Sub-contracted lab parameters.

Total Number of Containers

Sampled By:

Relinquished By:		Received By:	
Signature Judith Ochs	Date 23 APR 03 ~~1547~~	Signature Melinda S Kangalee	Date 23 Apr 03
Printed Name JUDITH OCHS	Time 1547	Printed Name M. Kangalee	Time 1547
Organization King County Environmental Laboratory		Organization King County Environmental Laboratory	

CONVENTIONAL ANALYSES QC DATA

METRO Environmental Laboratory

WORK GROUP REPORT (wk02)

May 13 2003, 01:32 pm

Work Group: WG68812 (PSD Norfolk) for Department: 3 - Conventionals

Created: 13-MAY-03 Due: Operator: BP

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	PSD	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03

Comments:

L28052-1	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-2	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-3	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-4	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-5	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-6	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-7	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-8	3 - 1/2 Grab Composite, 0 - 10 cm

PSD RSD Check

WG68812

GRAVEL							
Phi Size	Sample (%)	DUP (%)	TRIP (%)				
<-2	0	0.2	0.5				
-2	0.2	0.6	0.1				
-1	1.5	1.5	2	Avg. Total %	Std. Dev.	RSD %	
Total	1.7	2.3	2.6	2.2000	0.4583	20.830	Qualify with 'E'

SAND						
Phi Size	Sample (%)	DUP (%)	TRIP (%)			
0	16.6	14.6	14.1			
+1	50.3	51.3	54.6			
+2	23.7	26.4	22.7			
+3	0.9	0.7	0.9			
+4	0.3	0.3	0.3	Avg. Total %	Std. Dev.	RSD %
Total	91.8	93.3	92.6	92.5667	0.7506	0.811

L28052-4
03-A004302

SILT						
Phi Size	Sample (%)	DUP (%)	TRIP (%)			
+5	5.2	3.4	4.2			
+6	0	0.4	0			
+7	0.9	0.6	0.6			
+8	0.2	0	0	Avg. Total %	Std. Dev.	RSD %
Total	6.3	4.4	4.8	5.1667	1.0017	19.387

CLAY						
Phi Size	Sample (%)	DUP (%)	TRIP (%)			
+9	0	0	0			
+10	0	0	0			
>+10	0	0	0	Avg. Total %	Std. Dev.	RSD %
Total	0	0	0	0.0000	0.0000	#DIV/0!

AMTEST LABORATORIES

METHODOLOGY REPORT

AM TEST ID 03-A004299 MATRIX : Sediment
CLIENT ID L28052-1 SAMPLED: 4/23/03

ANALYTE	UNITS	METHOD NUMBER	METHOD REFERENCE	DETECTION LIMIT *	DATE OF ANALYSI
Grain Size	% Retained	D422	ASTM	0.10	5/ 1/03
Total Solids	%	p17	PSEP	0.01	5/ 1/03
Total Volatile Solids	%	p20	PSEP	0.01	5/ 2/03
Grain Size	% Retained	D422	ASTM	0.10	5/ 1/03
Total Solids	%	p17	PSEP	0.01	5/ 1/03
Total Volatile Solids	%	p20	PSEP	0.01	5/ 2/03
Grain Size	% Retained	D422	ASTM	0.10	5/ 1/03
Total Solids	%	p17	PSEP	0.01	5/ 1/03
Total Volatile Solids	%	p20	PSEP	0.01	5/ 2/03
Grain Size	% Retained	D422	ASTM	0.10	5/ 1/03
Total Solids	%	p17	PSEP	0.01	5/ 1/03
Total Volatile Solids	%	p20	PSEP	0.01	5/ 2/03
Grain Size	% Retained	D422	ASTM	0.10	5/ 1/03
Total Solids	%	p17	PSEP	0.01	5/ 1/03
Total Volatile Solids	%	p20	PSEP	0.01	5/ 2/03
Grain Size	% Retained	D422	ASTM	0.10	5/ 1/03
Total Solids	%	p17	PSEP	0.01	5/ 1/03
Total Volatile Solids	%	p20	PSEP	0.01	5/ 2/03
Grain Size	% Retained	D422	ASTM	0.10	5/ 1/03
Total Solids	%	p17	PSEP	0.01	5/ 1/03
Total Volatile Solids	%	p20	PSEP	0.01	5/ 2/03
Grain Size	% Retained	D422	ASTM	0.10	5/ 1/03
Total Solids	%	p17	PSEP	0.01	5/ 1/03
Total Volatile Solids	%	p20	PSEP	0.01	5/ 2/03

SM = Standard Methods for the Examination of Water and Wastewater 18th ed.
SW-846 = Test Methods for Evaluating Solid Waste Physical/Chemical Methods
EPA = Methods for Chemical Analysis of Water and Wastes 1983
* Instrument Detection Limit

AMTEST LABORATORIES

ANALYSIS REPORT

King Co DNR Environmental Lab
322 W Ewing St
LAB-NR-0100
Seattle, WA 98119
Attention: Sample Manager

Date Received: 4/24/03
Date Reported: 5/15/03

Project #: 423056-160

SEDIMENT SAMPLES

AM TEST Identification Number	03-A004299
Client Identification	L28052-1
Sampling Date	4/23/03

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Solids (%)	48.1		
Total Volatile Solids (%)	7.84		

GRAIN SIZE DISTRIBUTION

PHI	OPENING (MM)	% RETENTION	FRACTION	PERCENT
	4.75	0.20	gravel	1.00
-2	4.00	0.20		
-1	2.00	0.60		
0	1.00	2.10		
+1	0.50	22.2	sand	56.4
+2	0.25	18.1		
+3	0.125	2.10		
+4	0.063	11.9		
+5	0.032	12.9		
+6	0.016	11.0	silt	36.0
+7	0.008	8.30		
+8	0.004	3.80		
+9	0.002	1.80		
+10	0.001	1.10	clay	6.70
>+10	<0.001	3.80		

Gravel <-2 to -1 phi
Silt +5 to +8 phi
Sand 0 to +4 phi
Clay +9 to >+10 phi

Analysis by Tyler Screens and Hydrometer (ASTM D-422)

AMTEST LABORATORIES

ANALYSIS REPORT

King Co DNR Environmental Lab
322 W Ewing St
LAB-NR-0100
Seattle, WA 98119
Attention: Sample Manager

Date Received: 4/24/03
Date Reported: 5/15/03

Project #: 423056-160

SEDIMENT SAMPLES

AM TEST Identification Number	03-A004300
Client Identification	L28052-2
Sampling Date	4/23/03

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Solids (%)	61.3		
Total Volatile Solids (%)	5.38		

GRAIN SIZE DISTRIBUTION

PHI	OPENING (MM)	% RETENTION	FRACTION	PERCENT
	4.75	0.20	gravel	1.20
-2	4.00	0.20		
-1	2.00	0.80		
0	1.00	2.60		
+1	0.50	23.2	sand	69.8
+2	0.25	35.7		
+3	0.125	3.10		
+4	0.063	5.20		
+5	0.032	10.6		
+6	0.016	6.00	silt	25.3
+7	0.008	4.70		
+8	0.004	4.00		
+9	0.002	1.00		
+10	0.001	0.40	clay	3.70
>+10	<0.001	2.30		

Gravel <-2 to -1 phi
Silt +5 to +8 phi
Sand 0 to +4 phi
Clay +9 to >+10 phi

Analysis by Tyler Screens and Hydrometer (ASTM D-422)

AMTEST
LABORATORIES
ANALYSIS REPORT

King Co DNR Environmental Lab
Sample Manager

Date Received: 4/24/03
Date Reported: 5/15/03

SEDIMENT SAMPLES

AM TEST Identification Number 03-A004301
Client Identification L28052-3
Sampling Date 4/23/03

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Solids (%)	89.5		
Total Volatile Solids (%)	2.23		

GRAIN SIZE DISTRIBUTION

PHI	OPENING (MM)	% RETENTION	FRACTION	PERCENT
	4.75	< 0.1	gravel	2.90
-2	4.00	0.10		
-1	2.00	2.80		
0	1.00	26.4		
+1	0.50	50.2	sand	92.0
+2	0.25	14.0		
+3	0.125	0.80		
+4	0.063	0.60		
+5	0.032	4.30		
+6	0.016	0.30	silt	5.20
+7	0.008	0.60		
+8	0.004	< 0.1		
+9	0.002	< 0.1		
+10	0.001	< 0.1	clay	
>+10	<0.001	< 0.1		

Gravel <-2 to -1 phi
Silt +5 to +8 phi
Sand 0 to +4 phi
Clay +9 to >+10 phi

Analysis by Tyler Screens and Hydrometer (ASTM D-422)

AMTEST LABORATORIES
ANALYSIS REPORT

King Co DNR Environmental Lab
Sample Manager

Date Received: 4/24/03
Date Reported: 5/15/03

SEDIMENT SAMPLES

AM TEST Identification Number 03-A004302
Client Identification L28052-4
Sampling Date 4/23/03

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Solids (%)	86.6		
Total Volatile Solids (%)	1.72		

GRAIN SIZE DISTRIBUTION

PHI	OPENING (MM)	% RETENTION	FRACTION	PERCENT
	4.75	< 0.1	gravel	1.70
-2	4.00	0.20		
-1	2.00	1.50		
0	1.00	16.6		
+1	0.50	50.3	sand	91.8
+2	0.25	23.7		
+3	0.125	0.90		
+4	0.063	0.30		
+5	0.032	5.20		
+6	0.016	< 0.1	silt	6.30
+7	0.008	0.90		
+8	0.004	0.20		
+9	0.002	< 0.1		
+10	0.001	< 0.1	clay	
>+10	<0.001	< 0.1		

Gravel <-2 to -1 phi
Silt +5 to +8 phi
Sand 0 to +4 phi
Clay +9 to >+10 phi

Analysis by Tyler Screens and Hydrometer (ASTM D-422)

AMTEST LABORATORIES

ANALYSIS REPORT

King Co DNR Environmental Lab
Sample Manager

Date Received: 4/24/03
Date Reported: 5/15/03

SEDIMENT SAMPLES

AM TEST Identification Number 03-A004303
Client Identification L28052-5
Sampling Date 4/23/03

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Solids (%)	48.5		
Total Volatile Solids (%)	8.08		

GRAIN SIZE DISTRIBUTION

PHI	OPENING (MM)	% RETENTION	FRACTION	PERCENT
	4.75	0.20	gravel	0.80
-2	4.00	0.40		
-1	2.00	0.20		
0	1.00	0.80		
+1	0.50	1.60	sand	40.3
+2	0.25	1.60		
+3	0.125	7.80		
+4	0.063	28.5		
+5	0.032	22.7		
+6	0.016	11.8	silt	52.6
+7	0.008	11.2		
+8	0.004	6.90		
+9	0.002	1.70		
+10	0.001	0.50	clay	6.10
>+10	<0.001	3.90		

Gravel <-2 to -1 phi
Silt +5 to +8 phi
Sand 0 to +4 phi
Clay +9 to >+10 phi

Analysis by Tyler Screens and Hydrometer (ASTM D-422)

AMTEST LABORATORIES
ANALYSIS REPORT

King Co DNR Environmental Lab
Sample Manager

Date Received: 4/24/03
Date Reported: 5/15/03

SEDIMENT SAMPLES

AM TEST Identification Number 03-A004304
Client Identification L28052-6
Sampling Date 4/23/03

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Solids (%)	51.2		
Total Volatile Solids (%)	6.80		

GRAIN SIZE DISTRIBUTION

PHI	OPENING (MM)	% RETENTION	FRACTION	PERCENT
	4.75	0.20	gravel	1.00
-2	4.00	0.40		
-1	2.00	0.40		
0	1.00	0.80		
+1	0.50	4.70	sand	55.0
+2	0.25	8.80		
+3	0.125	18.0		
+4	0.063	22.7		
+5	0.032	15.0		
+6	0.016	9.60	silt	38.7
+7	0.008	8.70		
+8	0.004	5.40		
+9	0.002	2.60		
+10	0.001	1.50	clay	5.50
>+10	<0.001	1.40		

Gravel <-2 to -1 phi
Silt +5 to +8 phi
Sand 0 to +4 phi
Clay +9 to >+10 phi

Analysis by Tyler Screens and Hydrometer (ASTM D-422)

AMTEST
LABORATORIES
ANALYSIS REPORT

King Co DNR Environmental Lab
Sample Manager

Date Received: 4/24/03
Date Reported: 5/15/03

SEDIMENT SAMPLES

AM TEST Identification Number 03-A004305
Client Identification L28052-7
Sampling Date 4/23/03

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Solids (%)	84.8		
Total Volatile Solids (%)	1.68		

GRAIN SIZE DISTRIBUTION

PHI	OPENING (MM)	% RETENTION	FRACTION	PERCENT
	4.75	< 0.1	gravel	2.40
-2	4.00	< 0.1		
-1	2.00	2.40		
0	1.00	21.8		
+1	0.50	41.0	sand	93.5
+2	0.25	24.2		
+3	0.125	4.80		
+4	0.063	1.70		
+5	0.032	2.40		
+6	0.016	1.10	silt	4.10
+7	0.008	0.30		
+8	0.004	0.30		
+9	0.002	< 0.1		
+10	0.001	< 0.1	clay	
>+10	<0.001	< 0.1		

Gravel <-2 to -1 phi
Silt +5 to +8 phi
Sand 0 to +4 phi
Clay +9 to >+10 phi

Analysis by Tyler Screens and Hydrometer (ASTM D-422)

AMTEST LABORATORIES
ANALYSIS REPORT

King Co DNR Environmental Lab
Sample Manager

Date Received: 4/24/03
Date Reported: 5/15/03

SEDIMENT SAMPLES

AM TEST Identification Number 03-A004306
Client Identification L28052-8
Sampling Date 4/23/03

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Solids (%)	84.7		
Total Volatile Solids (%)	1.69		

GRAIN SIZE DISTRIBUTION

PHI	OPENING (MM)	% RETENTION	FRACTION	PERCENT
	4.75	0.40	gravel	3.10
-2	4.00	0.20		
-1	2.00	2.50		
0	1.00	14.5		
+1	0.50	41.1	sand	94.3
+2	0.25	35.3		
+3	0.125	2.80		
+4	0.063	0.60		
+5	0.032	2.00		
+6	0.016	0.40	silt	2.50
+7	0.008	0.10		
+8	0.004	< 0.1		
+9	0.002	< 0.1		
+10	0.001	< 0.1	clay	
>+10	<0.001	< 0.1		

Gravel <-2 to -1 phi
Silt +5 to +8 phi
Sand 0 to +4 phi
Clay +9 to >+10 phi

Analysis by Tyler Screens and Hydrometer (ASTM D-422)

AMTEST LABORATORIES

Lab I.D.			03-A004302	03-A004302'	03-A004302"	
Client I.D.						RPD%
phi/screen/open						
		4.75	0.0	0.2	0.5	100.08
-2	5	4.0	0.2	0.6	0.1	78.19
-1	10	1.7	1.5	1.5	2.0	16.44
0	16	1.0	16.6	14.6	14.1	8.85
+1	35	0.5	50.3	51.3	54.6	4.27
+2	60	.25	23.7	26.4	22.7	7.83
+3	120	.125	0.9	0.7	0.9	15.66
+4	230	.063	0.3	0.3	0.3	0.42
phi/hydrmtr/dia						
+5		.032	5.2	3.4	4.2	21.72
+6		.016	0.0	0.4	0.0	173.21
+7		.008	0.9	0.6	0.6	27.39
+8		.004	0.2	0.0	0.0	173.21
+9		.002	0.0	0.0	0.0	0.00
+10		.001	0.0	0.0	0.0	0.00
pass			0.0	0.0	0.0	0.00
% SUM			100.0	100.0	100.0	0.00
Total Solids:			86.60%	86.10%	85.90%	0.42
Volatile Solids:			1.72	1.15	1.72	21.51

Reported by: Aaron W Young

Aaron W. Young

phi size	Enter Sample Data as phi size										Flag
	L28052-4	dup	trip		L28054-4	dup	trip				
<-2	0	0.2	0.5					Average	STD DEV	%RSD	
-2	0.2	0.6	0.1	% gravel	1.7	2.3	2.6	2.2	0.458258	20.82989	E
-1	1.5	1.5	2	% sand	91.8	93.3	92.6	92.56667	0.750555	0.810827	
0	16.6	14.6	14.1	% silt	6.3	4.4	4.8	5.166667	1.001665	19.38707	
1	50.3	51.3	54.6	% clay	0	0	0	0	0	-	
2	23.7	26.4	22.7								
3	0.9	0.7	0.9	total =	99.8	100	100				
4	0.3	0.3	0.3								
5	5.2	3.4	4.2								
6	0	0.4	0								
7	0.9	0.6	0.6								
8	0.2	0	0								
9	0	0	0								
10	0	0	0								
>10	0	0	0								
% gravel = <-2 to -1											
% sand = 0 to +4											
% silt = +5 to +8											
% clay = +9 to >10											
Note: If the RSD is > 20% for a category, the data for that category should be flagged with E.											

METRO Environmental Laboratory

WORK GROUP REPORT (wk02)

May 16 2003, 11:45 am

Work Group: WG68640 (toc-soil) for Department: 3 - Conventionals

Created: 05-MAY-03 Due: Operator: casey

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	TOC	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
WG68640-1	MB			S	TOC	OTHR SOLID	ANAL	U	16-MAY-03	
WG68640-2	SRM			S	TOC	OTHR SOLID	ANAL	U	16-MAY-03	
WG68640-3	MB			S	TOC	OTHR SOLID	ANAL	U	16-MAY-03	
WG68640-4	SRM			S	TOC	OTHR SOLID	ANAL	U	16-MAY-03	
WG68640-5	SB			S	TOC	OTHR SOLID	ANAL	U	16-MAY-03	
WG68640-6	LD		SED	S	TOC	SALTWTRSED	ANAL	U	16-MAY-03	
WG68640-7	LT		SED	S	TOC	SALTWTRSED	ANAL	U	16-MAY-03	
WG68640-8	MS		SED	S	TOC	SALTWTRSED	ANAL	U	16-MAY-03	

Comments:

L28052-1	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-2	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-3	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-4	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-5	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-6	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-7	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG68640-2	HICONC
WG68640-4	HICONC
WG68640-5	WG68640-3
WG68640-6	L28052-5
WG68640-7	WG68640-6 L28052-5
WG68640-8	L28052-6

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/16/03 12:46
Run ID: R94063 Workgroup: WG68640 (toc-soil)

MB:WG68640-1 Matrix: OTHR SOLID Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Organic Carbon	500	1000	mg/Kg	<MDL	

SRM:WG68640-2 Matrix: OTHR SOLID Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Total Organic Carbon	2500	5000	mg/Kg	33480	34600	103		80-120

MB:WG68640-3 Matrix: OTHR SOLID Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Organic Carbon	500	1000	mg/Kg	<MDL	

SRM:WG68640-4 Matrix: OTHR SOLID Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Total Organic Carbon	2500	5000	mg/Kg	33480	36100	108		80-120

SB:WG68640-5 MB:WG68640-3 Matrix: OTHR SOLID Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
Total Organic Carbon	500	1000	mg/Kg	<MDL	2500	2430	97		80-120

LT:WG68640-7 LD:WG68640-6 L28052-5 Matrix: SALTWTRSED Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: 423056-160 Pkey: SED
(Lab Triplicate, Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	LT Value	RSD	Qual	LabLimit
Total Organic Carbon	1000	2000	mg/Kg	13400	13900	14000	2		20

MS:WG68640-8 L28052-6 Matrix: SALTWTRSED Listtype: CVTOC Method: EPA9060-PSEP96 (03-04-002-002) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec	Qual	LabLimit
Total Organic Carbon	1300	2600	mg/Kg	12600	6440	18400	89		70-130

METRO Environmental Laboratory

WORK GROUP REPORT (wk02)

May 08 2003, 07:52 am

Work Group: WG68644 (tots) for Department: 3 - Conventionals

Created: 05-MAY-03 Due: Operator: casey

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
8052-1	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
8052-2	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
28052-5	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
8052-6	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
8052-7	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	TOTS	SALTWTRSED	ANAL	U	23-APR-03	07-JUN-03
WG68644-1	MB			S	TOTS	OTHR SOLID	ANAL	U	08-MAY-03	
68644-2	LD		SED	S	TOTS	SALTWTRSED	ANAL	U	08-MAY-03	

mments:

L28052-1	3 - 1/2 Grab Composite, 0 - 2 cm
8052-2	3 - 1/2 Grab Composite, 0 - 10 cm
8052-3	3 - 1/2 Grab Composite, 0 - 2 cm
28052-4	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-5	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-6	3 - 1/2 Grab Composite, 0 - 10 cm
8052-7	3 - 1/2 Grab Composite, 0 - 2 cm
8052-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG68644-2	L28052-5

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/08/03 08:00
Run ID: R93784 Workgroup: WG68644 (tots)

MB:WG68644-1 Matrix: OTHR SOLID Listtype: CVTOTS Method: SM2540-G (03-01-007-001) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Total Solids	.005	.01	%	<MDL	

LD:WG68644-2 L28052-5 Matrix: SALTWTRSED Listtype: CVTOTS Method: SM2540-G (03-01-007-001) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	LabLimit
Total Solids	.005	.01	%	48.6	48.8	0		20

METAL CHEMISTRY QC DATA

METRO Environmental Laboratory

WORK GROUP REPORT (wk02)

May 12 2003, 07:05 am

Work Group: WG68754 (Norfolk Seds - 5/9/03) for Department: 6 - Metals, Trace

Created: 12-MAY-03 Due: Operator: ST

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP.	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP.	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP.	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-3	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-4	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03

METRO Environmental Laboratory

WORK GROUP REPORT (wk02)

May 12 2003, 07.05 am

Work Group: WG68754 (Norfolk Seds - 5/9/03) for Department: 6 - Metals, Trace

Created: 12-MAY-03 Due: Operator: ST

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	FE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	PB-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	MN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	TL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	ZN-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	SE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	NI-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	AS-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	AL-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	CD-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	CU-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	CR-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	AG-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
L28052-8	423056-160	Norfolk Cleanup Study	SED	S	BE-ICP	SALTWTRSED	WKGP	U	07-JUN-03	07-JUN-03
G68754-1	SB			S	ROUTINE ICP	BLANK WTR	WKGP	U	12-MAY-03	
G68754-2	LCS			S	ROUTINE ICP	SOIL	WKGP	U	12-MAY-03	
WG68754-3	SRM		SED	S	ROUTINE ICP	SALTWTRSED	WKGP	U	12-MAY-03	
WG68754-4	LD		SED	S	ROUTINE ICP	SALTWTRSED	WKGP	U	12-MAY-03	
WG68754-5	MS		SED	S	ROUTINE ICP	SALTWTRSED	WKGP	U	12-MAY-03	
G68754-6	SDIL		SED	S	ROUTINE ICP	SALTWTRSED	WKGP	U	12-MAY-03	
G68754-7	MB			S	ROUTINE ICP	BLANK WTR	WKGP	U	12-MAY-03	

Comments:

METRO Environmental Laboratory

WORK GROUP REPORT (wk02)

May 12 2003, 07:05 am

Work Group: WG68754 (Norfolk Seds - 5/9/03) for Department: 6 - Metals, Trace

Created: 12-MAY-03 Due: Operator: ST

Sample	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L28052-1		3 - 1/2 Grab Composite, 0 - 2 cm								
L28052-2		3 - 1/2 Grab Composite, 0 - 10 cm								
L28052-3		3 - 1/2 Grab Composite, 0 - 2 cm								
L28052-4		3 - 1/2 Grab Composite, 0 - 10 cm								
L28052-5		3 - 1/2 Grab Composite, 0 - 2 cm								
L28052-6		3 - 1/2 Grab Composite, 0 - 10 cm								
L28052-7		3 - 1/2 Grab Composite, 0 - 2 cm								
L28052-8		3 - 1/2 Grab Composite, 0 - 10 cm								
WG68754-1		WG68754-7 ICP200								
WG68754-2		ERA SOIL								
WG68754-3		PACS1								
WG68754-4		L28052-8 RPD-SOL								
WG68754-5		L28052-8 ICP200								
WG68754-6		L28052-8 5X								
WG68754-7		METHOD BLANK								

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 06/11/03 02:17
Run ID: R94563 Workgroup: WG68754 (Norfolk Seds - 5/9/03)

SB:WG68754-1 MB:WG68754-7 Matrix: BLANK WTR Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
Silver, Total, ICP	.004	.02	mg/L	<MDL	1.2	1.1	92		85-115
Aluminum, Total, ICP	.1	.5	mg/L	<MDL	12	11.6	96		85-115
Arsenic, Total, ICP	.05	.25	mg/L	<MDL	4	3.79	95		85-115
Beryllium, Total, ICP	.001	.005	mg/L	<MDL	.4	.376	94		85-115
Cadmium, Total, ICP	.003	.015	mg/L	<MDL	1.2	1.08	90		85-115
Chromium, Total, ICP	.005	.025	mg/L	<MDL	1.2	1.13	94		85-115
Copper, Total, ICP	.004	.02	mg/L	<MDL	1.2	1.17	97		85-115
Iron, Total, ICP	.05	.25	mg/L	<MDL	50	47	94		85-115
Manganese, Total, ICP	.002	.01	mg/L	<MDL	5	4.83	97		85-115
Nickel, Total, ICP	.02	.1	mg/L	<MDL	1.2	1.12	94		85-115
Lead, Total, ICP	.03	.15	mg/L	<MDL	4	3.66	92		85-115
Selenium, Total, ICP	.05	.25	mg/L	<MDL	2	1.88	94		85-115
Thallium, Total, ICP	.2	1	mg/L	<MDL	4	3.73	93		85-115
Zinc, Total, ICP	.005	.025	mg/L	<MDL	5	4.61	92		85-115

LCS:WG68754-2 Matrix: SOIL Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Lab Control Sample)

Parameter	Mdl	Rdl	Units	Truevalue	LCS Value	% Rec.	Qual	LabLimit
Silver, Total, ICP	.9	4.52	mg/Kg	125	112	90		80-120
Aluminum, Total, ICP	23	113	mg/Kg	8550	6990	82		80-120
Arsenic, Total, ICP	11	56.5	mg/Kg	132	110	84		80-120
Beryllium, Total, ICP	.23	1.13	mg/Kg	90.1	80.4	89		80-120
Cadmium, Total, ICP	.68	3.39	mg/Kg	51.5	42.6	83		80-120
Chromium, Total, ICP	1.1	5.65	mg/Kg	142	123	87		80-120
Copper, Total, ICP	.9	4.52	mg/Kg	152	141	93		80-120
Iron, Total, ICP	11	56.5	mg/Kg	14400	12400	86		80-120
Manganese, Total, ICP	.45	2.26	mg/Kg	1020	935	92		80-120
Nickel, Total, ICP	4.5	22.6	mg/Kg	55.4	48.4	87		80-120
Lead, Total, ICP	6.8	33.9	mg/Kg	52.9	51.8	98		80-120
Selenium, Total, ICP	11	56.5	mg/Kg	60.9	56.9	93		80-120
Thallium, Total, ICP	45	226	mg/Kg	108	98	91		80-120
Zinc, Total, ICP	1.1	5.65	mg/Kg	587	498	85		80-120

SRM:WG68754-3 Matrix: SALTWTRSED Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Arsenic, Total, ICP	11	55.7	mg/Kg	211	163	77		120
Cadmium, Total, ICP	.67	3.34	mg/Kg	2.38	2.4	101		120
Chromium, Total, ICP	1.1	5.57	mg/Kg	113	50.1	44		120
Copper, Total, ICP	.89	4.45	mg/Kg	452	412	91		120
Manganese, Total, ICP	.45	2.23	mg/Kg	470	261	56		120
Nickel, Total, ICP	4.5	22.3	mg/Kg	44.1	30.9	70		120
Lead, Total, ICP	6.7	33.4	mg/Kg	404	339	84		120
Selenium, Total, ICP	11	55.7	mg/Kg	1.09	<MDL	0		120
Zinc, Total, ICP	1.1	5.57	mg/Kg	824	702	85		120

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 06/11/03 02:17
Run ID: R94563 Workgroup: WG68754 (Norfolk Seds - 5/9/03)

LD:WG68754-4 L28052-8 Matrix: SALTWTRSED Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	LabLimit
Silver, Total, ICP	.19	.961	mg/Kg	<MDL	<MDL			20
Aluminum, Total, ICP	4.8	24	mg/Kg	6530	6960	6		20
Arsenic, Total, ICP	2.4	12	mg/Kg	4.1	4.9			20
Beryllium, Total, ICP	.048	.24	mg/Kg	.15	.17			20
Cadmium, Total, ICP	.14	.721	mg/Kg	<MDL	<MDL			20
Chromium, Total, ICP	.24	1.2	mg/Kg	8.36	9.64	14		20
Copper, Total, ICP	.19	.961	mg/Kg	9.59	10.5	9		20
Iron, Total, ICP	2.4	12	mg/Kg	14900	15200	2		20
Manganese, Total, ICP	.096	.48	mg/Kg	204	216	6		20
Nickel, Total, ICP	.96	4.8	mg/Kg	8.98	10.8	18		20
Lead, Total, ICP	1.4	7.21	mg/Kg	3.6	3.8			20
Selenium, Total, ICP	2.4	12	mg/Kg	<MDL	<MDL			20
Thallium, Total, ICP	9.6	48	mg/Kg	<MDL	<MDL			20
Zinc, Total, ICP	.24	1.2	mg/Kg	34.6	35.6	3		20

MS:WG68754-5 L28052-8 Matrix: SALTWTRSED Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit
Silver, Total, ICP	.21	1.04	mg/Kg	<MDL	62.1	56	90		75-125
Aluminum, Total, ICP	5.2	25.9	mg/Kg	6530	621.	7560	165	L	75-125
Arsenic, Total, ICP	2.6	12.9	mg/Kg	4.1	207.	195	92		75-125
Beryllium, Total, ICP	.052	.259	mg/Kg	.15	20.7	19.3	93		75-125
Cadmium, Total, ICP	.16	.776	mg/Kg	<MDL	62.1	55.5	89		75-125
Chromium, Total, ICP	.26	1.29	mg/Kg	8.36	62.1	67.4	95		75-125
Copper, Total, ICP	.21	1.04	mg/Kg	9.59	62.1	69.1	96		75-125
Iron, Total, ICP	2.6	12.9	mg/Kg	14900	2590	15500	22	G	75-125
Manganese, Total, ICP	.1	.518	mg/Kg	204	259.	434	89		75-125
Nickel, Total, ICP	1	5.18	mg/Kg	8.98	62.1	66.2	92		75-125
Lead, Total, ICP	1.6	7.76	mg/Kg	3.6	207.	189	90		75-125
Selenium, Total, ICP	2.6	12.9	mg/Kg	<MDL	104.	95.9	93		75-125
Thallium, Total, ICP	10	51.8	mg/Kg	<MDL	207.	186	90		75-125
Zinc, Total, ICP	.26	1.29	mg/Kg	34.6	259.	254	85		75-125

SDIL:WG68754-6 Matrix: SALTWTRSED Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Serial Dilution)

Parameter	Mdl	Rdl	Units	Value	Truevalue	SDIL Value	% Rec.	Qual	LabLimit

MB:WG68754-7 Matrix: BLANK WTR Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Silver, Total, ICP	.004	.02	mg/L	<MDL	
Aluminum, Total, ICP	.1	.5	mg/L	<MDL	
Arsenic, Total, ICP	.05	.25	mg/L	<MDL	
Beryllium, Total, ICP	.001	.005	mg/L	<MDL	

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 06/11/03 02:17
Run ID: R94563 Workgroup: WG68754 (Norfolk Seds - 5/9/03)

MB:WG68754-7 Matrix: BLANK WTR Listtype: MTICP-SED Method: EPA3050A/6010B (06-02-004-002) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Cadmium, Total, ICP	.003	.015	mg/L	<MDL	
Chromium, Total, ICP	.005	.025	mg/L	<MDL	
Copper, Total, ICP	.004	.02	mg/L	<MDL	
Iron, Total, ICP	.05	.25	mg/L	<MDL	
Manganese, Total, ICP	.002	.01	mg/L	<MDL	
Nickel, Total, ICP	.02	.1	mg/L	<MDL	
Lead, Total, ICP	.03	.15	mg/L	<MDL	
Selenium, Total, ICP	.05	.25	mg/L	<MDL	
Thallium, Total, ICP	.2	1	mg/L	<MDL	
Zinc, Total, ICP	.005	.025	mg/L	<MDL	

KING COUNTY ENVIRONMENTAL LABORATORY

Trace Metals Section ICP Preparation Log

Preparation Method: EPA 3050
Project Number(s): 4230560
Project Description(s): Norfolk Seds
Preparation Date: 6/5/03

Work Group #: WG 68754
Analyst: ST
Matrices: SF- Saltwater Seds
Preparation: ~~1st~~ 2nd 3rd
6/5/03 ST

Analytical Samples

	Sample Number	Aliquot (g or mL)	Final Vol.(mL)	Comments	pH <2		Sample Number	Aliquot (g or mL)	Final Vol.(mL)	Comments	pH <2
1	L28052-1	2.1473	50			11					
2	-2	2.0796				12					
3	-3	1.0378				13					
4	-4	1.0321				14					
5	-5	1.3284				15					
6	-6	1.1265				16					
7	-7	1.0265				17					
8	-8	1.0452		BKG		18					
9						19					
10						20					

Quality Control Samples

	QC Sample Number	QC Sample Description	Aliquot (g or mL)	Final Vol.(mL)	Comments
1	WG 68754 -1	spk Blk	—	50	
2	-2	ERA 50.1	~~2.2412~~ 2.2412 ul 6/05 ST		
3	-3	PACS -1	.2246		
4	-4	L28052-8 Lab Dup	1.0406		
5	-5	L28052-8 Mat spk	.4660		
6	-6	L28052-8 SD:1	*	*	SX
7	-7	Method Blk	—	50	
8		Matrix spike Dup	1.0039		
9		SB -2	—		
10		SB-3	—		
		SB-4	—		

Spike Solution

	Solution Name	Solution ID #	Solution Conc.	Amount Used (uL)
1	STD 1A	M1-11-6	varies	200
2	STD 1B	M1-11-3	1000 ppm	
3	STD 2A	M1-11-10	varies	
4	STD 2B	M1-11-11	300 ppm	
5	STD 3	M1-11-8	varies	500
6	MM	M1-9-13	1000 ppm	210
7	ZM	M1-9-9		180

LCS Solution

	Solution Name	Solution ID #	Solution Conc.	Amount Used (mL)
1	6/5/03 ST			
2				
3				
4				

Comments: stored @ -20°C thawed prior to digest
SB-2,3,4: MSD for data comparison purposes only - data not reported.
WG 68754-6 is a ST serial dilution that is to be prepared by the ICP operator at the time of analysis. 1st prep on 5/9/03 redone due to SRM failure.

METRO Environmental Laboratory

WORK GROUP REPORT (wk02)

May 08 2003, 01:33 pm

Work Group: WG68731 (Norfolk Seds.) for Department: 6 - Metals, Trace

Created: 08-MAY-03 Due: Operator: SH

ple	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-MAY-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-MAY-03	07-JUN-03
L 052-3	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-MAY-03	07-JUN-03
L 052-4	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-MAY-03	07-JUN-03
L 052-5	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-MAY-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-MAY-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-MAY-03	07-JUN-03
L 052-8	423056-160	Norfolk Cleanup Study	SED	S	HG-CVAA	SALTWTRSED	WKGP	U	21-MAY-03	07-JUN-03
8731-1	SRM		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	08-MAY-03	
WG68731-2	MB			S	HG-CVAA	BLANK WTR	WKGP	U	08-MAY-03	
WG68731-3	SB			S	HG-CVAA	BLANK WTR	WKGP	U	08-MAY-03	
8731-4	LD		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	08-MAY-03	
8731-5	MS		SED	S	HG-CVAA	SALTWTRSED	WKGP	U	08-MAY-03	

Comments:

052-1	3 - 1/2 Grab Composite, 0 - 2 cm
L 052-2	3 - 1/2 Grab Composite, 0 - 10 cm
L 052-3	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-4	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-5	3 - 1/2 Grab Composite, 0 - 2 cm
L 052-6	3 - 1/2 Grab Composite, 0 - 10 cm
L 052-7	3 - 1/2 Grab Composite, 0 - 2 cm
L 052-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG68731-1	PACS1
WG68731-2	METHOD BLANK
8731-3	WG68731-2 HG-SOL
8731-4	L28052-4 RPD-SOL
8731-5	L28052-4 HG-SOL

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/12/03 11:34
Run ID: R93895 Workgroup: WG68731 (Norfolk Seds.)

SRM:WG68731-1 Matrix: SALTWTRSED Listtype: MTHG-SED Method: EPA 245.5 (06-01-004-003) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	LabLimit
Mercury, Total, CVAA	.1	.995	mg/Kg	4.57	4.38	96		120

MB:WG68731-2 Matrix: BLANK WTR Listtype: MTHG-SED Method: EPA 245.5 (06-01-004-003) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Mercury, Total, CVAA	.0002	.002	mg/L	<MDL	

SB:WG68731-3 MB:WG68731-2 Matrix: BLANK WTR Listtype: MTHG-SED Method: EPA 245.5 (06-01-004-003) Project: Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
Mercury, Total, CVAA	.0002	.002	mg/L	<MDL	.005	.00535	107		85-115

LD:WG68731-4 L28052-4 Matrix: SALTWTRSED Listtype: MTHG-SED Method: EPA 245.5 (06-01-004-003) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	LabLimit
Mercury, Total, CVAA	.02	.196	mg/Kg	<MDL	.02			20

MS:WG68731-5 L28052-4 Matrix: SALTWTRSED Listtype: MTHG-SED Method: EPA 245.5 (06-01-004-003) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit
Mercury, Total, CVAA	.02	.196	mg/Kg	<MDL	0.491	.534	109		75-125

KING COUNTY ENVIRONMENTAL LABORATORY

Trace Metals Section HG-CVAA Preparation Log

Preparation Method: EPA 245.5
Project Number(s): 423056-160
Project Description(s): Norfolk Sedi
Preparation Date: 5/7/03
Temperature: 44.1°C

Work Group #: WG68731
Analyst: SH
Matrices: marine sediment
Preparation: (1st) 2nd 3rd

Analytical Samples

	Sample Number	Aliquot (g or mL)	Final Vol.(mL)	Comments	pH <2		Sample Number	Aliquot (g or mL)	Final Vol.(mL)	Comments	pH <2
1	L28052-1	1.561	126			11					
2	-2	1.444				12					
3	-3	1.001				13					
4	-4	0.994		BKG		14					
5	-5	1.369				15					
6	-6	1.141				16					
7	-7	1.053				17					
8	-8	0.984				18					
9						19					
10						20					

Calibration Standards

	Calibration Standard	QC Sample Description	Aliquot (g or mL)	Final Vol.(mL)	Solution ID #	Solution Conc.	Amount Used (uL)
1	0	Calibration Std	10	126			
2	1				Hg-03-137	2ppm	50
3	2.5						125
4	5						250
5	10						500
6	20						1000
7							

* Calibration Standards and pre-digestion dilutions are based on a 100/25/20 mL final volume

Quality Control Samples

	QC Sample Number	QC Sample Description	Aliquot (g or mL)	Final Vol.(mL)	Solution ID #	Solution Conc.	Amount Used (uL)
1	WG68731-1	SRM	0.201	126	NRCC PACS-1		
2	-2	Method Blank	10mL			~~2~~ SH 5/7/03	
3	-3	Spike Blank			Hg-03-137	2ppm	250
4	-4	Lab Dup L28052-4	1.021				
5	-5	Matrix Spike L28052-4	1.079		Hg-03-137	2ppm	250
6	CCV	Ins. Check Std	10mL				250
7	CRA						10
8	ICV				NIST1640	1.59ppm	500
9							
10							
11							
12							

Reagent Solution ID #'s

$KMnO_4$	Hg-03-123, -125	$K_2S_2O_8$	—	NH_2OH-HCL	Hg-03-112	$SnCl_2$	Hg-03-136

Comments: Samples are unpreserved & stored @ -20°C.

ORGANIC CHEMISTRY QC DATA

METRO Environmental Laboratory

WORK GROUP REPORT (wk02)

May 22 2003, 09:01 am

Work Group: WG68555 (BS#131 bnallfull) for Department: 7 - Organics, Trace

Created: 30-APR-03 Due: Operator: GW/LM

mple	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
8052-3	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
8052-4	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
L28052-5	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
8052-8	423056-160	Norfolk Cleanup Study	SED	S	BNALLFULL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
68555-1	MB			S	BNALLFULL	OTHR SOLID	PREP	U	30-APR-03	
WG68555-2	SB			S	BNALLFULL	OTHR SOLID	PREP	U	30-APR-03	
WG68555-3	MS		SED	S	BNALLFULL	SALTWTRSED	PREP	U	30-APR-03	
68555-4	MSD		SED	S	BNALLFULL	SALTWTRSED	PREP	U	30-APR-03	
68555-5	SRM		SED	S	BNALLFULL	SALTWTRSED	PREP	U	30-APR-03	
68555-6	LD		SED	S	BNALLFULL	SALTWTRSED	PREP	U	30-APR-03	

Comments:

8052-1	3 - 1/2 Grab Composite, 0 - 2 cm
8052-2	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-3	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-4	3 - 1/2 Grab Composite, 0 - 10 cm
8052-5	3 - 1/2 Grab Composite, 0 - 2 cm
8052-6	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-7	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-8	3 - 1/2 Grab Composite, 0 - 10 cm
68555-1	MB030430
68555-2	WG68555-1
68555-3	L28052-3
WG68555-4	WG68555-3 L28052-3
WG68555-5	1944
68555-6	L28052-4

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/29/03 02:31
Run ID: R93916 Workgroup: WG68555 (BS#131 bnallfull)

A/M
6/9/03
NMS

MB:WG68555-1 Matrix: OTHR SOLID Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
N-Nitrosodimethylamine	130	267	ug/Kg	<MDL	
Phenol	9	18	ug/Kg	<MDL	
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	
2-Chlorophenol	8	16	ug/Kg	<MDL	
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	
1,4-Dichlorobenzene	.13	.264	ug/Kg	<MDL	
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	
Hexachloroethane	15	30	ug/Kg	<MDL	
Nitrobenzene	16	32	ug/Kg	<MDL	
Isophorone	19	38	ug/Kg	<MDL	
2-Nitrophenol	15	30	ug/Kg	<MDL	
2,4-Dimethylphenol	7	14	ug/Kg	<MDL	
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	
Naphthalene	14	28	ug/Kg	<MDL	
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	
2-Chloronaphthalene	16	32	ug/Kg	<MDL	
Acenaphthylene	15	30	ug/Kg	<MDL	
Dimethyl Phthalate	11	22	ug/Kg	<MDL	
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	
Acenaphthene	7	14	ug/Kg	<MDL	
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	
4-Nitrophenol	13	26.7	ug/Kg	<MDL	
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	
Fluorene	13	26	ug/Kg	<MDL	
Diethyl Phthalate	6	12	ug/Kg	<MDL	
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	
N-Nitrosodiphenylamine	20	40	ug/Kg	<MDL	
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	
Pentachlorophenol	5	10	ug/Kg	<MDL	
Phenanthrene	4	8	ug/Kg	<MDL	
Anthracene	4	8	ug/Kg	<MDL	
Di-N-Butyl Phthalate	5	10	ug/Kg	9	B
Fluoranthene	8	16	ug/Kg	<MDL	
Pyrene	4	8	ug/Kg	<MDL	
Benzyl Butyl Phthalate	6	12	ug/Kg	9.2	B
Benzo(a)anthracene	2	4	ug/Kg	<MDL	
Chrysene	4	8	ug/Kg	<MDL	
3,3'-Dichlorobenzidine	13	26.7	ug/Kg	<MDL	
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	27.7	B
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	
Benzo(b)fluoranthene	3	6	ug/Kg	<MDL	

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/29/03 02:31
Run ID: R93916 Workgroup: WG68555 (BS#131 bnallfull)

MB:WG68555-1 Matrix: OTHR SOLID Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Benzo(k)fluoranthene	3	6	ug/Kg	<MDL	
Benzo(a)pyrene	3	6	ug/Kg	<MDL	
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	
Benzo(g,h,i)perylene	8	16	ug/Kg	<MDL	
Aniline	130	267	ug/Kg	<MDL	
Benzyl Alcohol	6	12	ug/Kg	<MDL	
2-Methylphenol	19	38	ug/Kg	<MDL	
4-Methylphenol	16	32	ug/Kg	<MDL	
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	
Benzoic Acid	27	133	ug/Kg	<MDL	
2-Methylnaphthalene	14	28	ug/Kg	<MDL	
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	
2-Nitroaniline	13	26.7	ug/Kg	<MDL	
3-Nitroaniline	13	26.7	ug/Kg	<MDL	
Dibenzofuran	14	28	ug/Kg	<MDL	
4-Nitroaniline	13	26.7	ug/Kg	<MDL	
Carbazole	7	14	ug/Kg	<MDL	
Coprostanol	14	28	ug/Kg	<MDL	
Caffeine	6	12	ug/Kg	<MDL	

SB:WG68555-2 MB:WG68555-1 Matrix: OTHR SOLID Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
N-Nitrosodimethylamine	27	267	ug/Kg	<MDL	133.	110	84		14-101
Phenol	9	18	ug/Kg	<MDL	133.	79	59		7-107
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	133.	72.3	54		18-82
2-Chlorophenol	8	16	ug/Kg	<MDL	133.	78.5	59		8-102
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	76.2	57		18-95
1,4-Dichlorobenzene	.13	.264	ug/Kg	<MDL	133.	76.1	57		21-99
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	75.3	56		0-116
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	133.	70.8	53		1-104
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	133.	77.5	58		0-146
Hexachloroethane	15	30	ug/Kg	<MDL	133.	72.4	54		17-92
Nitrobenzene	16	32	ug/Kg	<MDL	133.	91.3	68		0-112
Isophorone	19	38	ug/Kg	<MDL	133.	88.7	67		1-131
2-Nitrophenol	15	30	ug/Kg	<MDL	133.	102	77		21-98
2,4-Dimethylphenol	7	14	ug/Kg	<MDL	133.	21.6	16		0-81
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	133.	84.6	63		19-103
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	133.	84.6	63		24-103
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	133.	82.3	62		13-110
Naphthalene	14	28	ug/Kg	<MDL	133.	83	62		17-94
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	133.	77.5	58		7-97
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	133.	103	77		50-105
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	133.	51	38		0-109
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	133.	91	68		27-98
2-Chloronaphthalene	16	32	ug/Kg	<MDL	133.	82.9	62		25-96
Acenaphthylene	15	30	ug/Kg	<MDL	133.	89.9	67		31-101
Dimethyl Phthalate	11	22	ug/Kg	<MDL	133.	104	78		38-114
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	133.	118	89		46-110

SB:WG68555-2 MB:WG68555-1 Matrix: OTHR SOLID Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
Acenaphthene	7	14	ug/Kg	<MDL	133.	86.1	65		29-102
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	133.	76.8	58		0-149
4-Nitrophenol	13	26.7	ug/Kg	<MDL	133.	91.9	69		40-170
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	133.	124	93		35-148
Fluorene	13	26	ug/Kg	<MDL	133.	102	76		39-106
Diethyl Phthalate	6	12	ug/Kg	<MDL	133.	123	92		51-118
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	133.	96.8	73		39-101
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	133.	120	90		18-157
N-Nitrosodiphenylamine	20	40	ug/Kg	<MDL	133.	95.4	72		11-148
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	133.	105	79		32-125
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	133.	110	82		47-113
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	133.	102	76		40-111
Pentachlorophenol	5	10	ug/Kg	<MDL	133.	107	81		38-124
Phenanthrene	4	8	ug/Kg	<MDL	133.	107	80		57-104
Anthracene	4	8	ug/Kg	<MDL	133.	103	77		45-114
Di-N-Butyl Phthalate	5	10	ug/Kg	9	133.	138	97		17-180
Fluoranthene	8	16	ug/Kg	<MDL	133.	123	92		55-132
Pyrene	4	8	ug/Kg	<MDL	133.	132	99		48-132
Benzyl Butyl Phthalate	6	12	ug/Kg	9.2	133.	142	100		15-183
Benzo(a)anthracene	2	4	ug/Kg	<MDL	133.	120	90		69-117
Chrysene	4	8	ug/Kg	<MDL	133.	107	80		69-111
3,3'-Dichlorobenzidine	13	26.7	ug/Kg	<MDL	133.	33.9	25		18-86
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	27.7	133.	150	92		8-182
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	133.	152	114		2-202
Benzo(b)fluoranthene	3	6	ug/Kg	<MDL	133.	111	83		50-121
Benzo(k)fluoranthene	3	6	ug/Kg	<MDL	133.	132	99		58-128
Benzo(a)pyrene	3	6	ug/Kg	<MDL	133.	99.1	74		15-137
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	133.	112	84		51-132
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	133.	114	85		53-129
Benzo(g,h,i)perylene	8	16	ug/Kg	<MDL	133.	117	88		46-126
Aniline	130	267	ug/Kg	<MDL	133.	<MDL	0		0-102
Benzyl Alcohol	6	12	ug/Kg	<MDL	133.	79.8	60		0-119
2-Methylphenol	19	38	ug/Kg	<MDL	133.	66.7	50		16-91
4-Methylphenol	16	32	ug/Kg	<MDL	133.	67.6	51		6-125
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	133.	<MDL	0		0-57
Benzoic Acid	27	133	ug/Kg	<MDL	133.	40	30		0-170
2-Methylnaphthalene	14	28	ug/Kg	<MDL	133.	83.8	63		22-99
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	133.	103	77		33-113
2-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	107	80		57-95
3-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	48.9	37		34-72
Dibenzofuran	14	28	ug/Kg	<MDL	133.	89.8	67		37-97
4-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	69.4	52		45-130
Carbazole	7	14	ug/Kg	<MDL	133.	113	85		44-179
Coprostanol	14	28	ug/Kg	<MDL	1330	1420	106		0-159
Caffeine	6	12	ug/Kg	<MDL	133.	118	88		45-159

Matrix Spike Report
MS:WG68555-3 L28052-3 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	QA1Limit
N-Nitrosodimethylamine	27	267	ug/Kg	<MDL	133.	74	56		50-150
Phenol	9	18	ug/Kg	<MDL	133.	84.5	63		50-150
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	133.	70.1	53		50-150
2-Chlorophenol	8	16	ug/Kg	<MDL	133.	82.6	62		50-150
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	77.9	58		50-150
1,4-Dichlorobenzene	.13	.264	ug/Kg	.48	133.	75.3	56		50-150
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	76.1	57		50-150
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	133.	82.1	62		50-150
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	133.	82.1	62		50-150
Hexachloroethane	15	30	ug/Kg	<MDL	133.	68.5	51		50-150
Nitrobenzene	16	32	ug/Kg	<MDL	133.	91.3	68		50-150
Isophorone	19	38	ug/Kg	<MDL	133.	92.2	69		50-150
2-Nitrophenol	15	30	ug/Kg	<MDL	133.	108	81		50-150
2,4-Dimethylphenol	2.7	14	ug/Kg	<MDL	133.	5.1	4	X	50-150
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	133.	87	65		50-150
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	133.	95	71		50-150
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	133.	81	61		50-150
Naphthalene	14	28	ug/Kg	<MDL	133.	83.3	62		50-150
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	133.	75.5	57		50-150
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	133.	103	77		50-150
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	133.	33	25	G	50-150
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	133.	100	75		50-150
2-Chloronaphthalene	16	32	ug/Kg	<MDL	133.	89.7	67		50-150
Acenaphthylene	15	30	ug/Kg	<MDL	133.	101	76		50-150
Dimethyl Phthalate	11	22	ug/Kg	<MDL	133.	110	83		50-150
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	133.	128	96		50-150
Acenaphthene	7	14	ug/Kg	<MDL	133.	96.7	73		50-150
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	133.	88.2	66		50-150
4-Nitrophenol	13	26.7	ug/Kg	<MDL	133.	112	84		50-150
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	133.	130	98		50-150
Fluorene	13	26	ug/Kg	<MDL	133.	109	82		50-150
Diethyl Phthalate	6	12	ug/Kg	<MDL	133.	122	92		50-150
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	133.	104	78		50-150
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	133.	120	90		50-150
N-Nitrosodiphenylamine	20	40	ug/Kg	<MDL	133.	94.7	71		50-150
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	133.	110	82		50-150
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	133.	116	87		50-150
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	133.	106	80		50-150
Pentachlorophenol	5	10	ug/Kg	<MDL	133.	108	81		50-150
Phenanthrene	4	8	ug/Kg	8.27	133.	107	74		50-150
Anthracene	4	8	ug/Kg	<MDL	133.	104	78		50-150
Di-N-Butyl Phthalate	5	10	ug/Kg	8.4	133.	135	95		50-150
Fluoranthene	8	16	ug/Kg	21.9	133.	124	76		50-150
Pyrene	4	8	ug/Kg	19.5	133.	136	88		50-150
Benzyl Butyl Phthalate	6	12	ug/Kg	17.8	133.	141	92		50-150
Benzo(a)anthracene	2	4	ug/Kg	7.28	133.	122	86		50-150
Chrysene	4	8	ug/Kg	11.3	133.	112	76		50-150
3,3'-Dichlorobenzidine	2.7	26.7	ug/Kg	<MDL	133	3.4	3	X	50-150
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	43.5	133.	157	85		50-150
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	133.	155	116		50-150

Matrix Spike Report
MS:WG68555-3 L28052-3 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	QA1Limit
Benzo(b)fluoranthene	3	6	ug/Kg	13.4	133.	114	75		50-150
Benzo(k)fluoranthene	3	6	ug/Kg	11.1	133.	137	95		50-150
Benzo(a)pyrene	3	6	ug/Kg	10.9	133.	110	74		50-150
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	133.	115	86		50-150
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	133.	117	88		50-150
Benzo(g,h,i)perylene	8	16	ug/Kg	<MDL	133.	117	88		50-150
Aniline	130	267	ug/Kg	<MDL	133.	<MDL	0	X	50-150
Benzyl Alcohol	6	12	ug/Kg	<MDL	133.	84.7	64		50-150
2-Methylphenol	19	38	ug/Kg	<MDL	133.	55.4	42	G	50-150
4-Methylphenol	16	32	ug/Kg	<MDL	133.	59.8	45	G	50-150
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	133.	<MDL	0	X	50-150
Benzoic Acid	27	133	ug/Kg	36	133.	110	53		50-150
2-Methylnaphthalene	14	28	ug/Kg	<MDL	133.	87.7	66		50-150
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	133.	108	81		50-150
2-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	107	81		50-150
3-Nitroaniline	8	26.7	ug/Kg	<MDL	133.	10	8	X	50-150
Dibenzofuran	14	28	ug/Kg	<MDL	133.	101	76		50-150
4-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	33.7	25	G	50-150
Carbazole	7	14	ug/Kg	<MDL	133.	109	82		50-150
Coprostanol	14	28	ug/Kg	22	1330	1350	99		50-150
Caffeine	6	12	ug/Kg	<MDL	133.	110	82		50-150

Matrix Spike Duplicate Report
MSD:WG68555-4 MS:WG68555-3 L28052-3 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Matrix Spike Duplicate, Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit	Truevalue	MSD Value	% Rec.	Qual	LabLimit	RPD
N-Nitrosodimethylamine	27	267	ug/Kg	<MDL	133.	74	56		0-119	133.	69	52		0-119	7
Phenol	9	18	ug/Kg	<MDL	133.	84.5	63		0-127	133.	82	61		0-127	3
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	133.	70.1	53		6-80	133.	69.8	52		6-80	2
2-Chlorophenol	8	16	ug/Kg	<MDL	133.	82.6	62		4-112	133.	80.5	60		4-112	3
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	77.9	58		0-103	133.	74.5	56		0-103	4
1,4-Dichlorobenzene	.13	.264	ug/Kg	.48	133.	75.3	56		0-104	133.	77	57		0-104	2
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	133.	76.1	57		0-105	133.	76.5	57		0-105	0
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	133.	82.1	62		0-142	133.	78.3	59		0-142	5
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	133.	82.1	62		0-176	133.	78.6	59		0-176	5
Hexachloroethane	15	30	ug/Kg	<MDL	133.	68.5	51		3-89	133.	68.5	51		3-89	0
Nitrobenzene	16	32	ug/Kg	<MDL	133.	91.3	68		3-105	133.	92	69		3-105	1
Isophorone	19	38	ug/Kg	<MDL	133.	92.2	69		16-130	133.	91.6	69		16-130	0
2-Nitrophenol	15	30	ug/Kg	<MDL	133.	108	81		20-107	133.	106	80		20-107	1
2,4-Dimethylphenol	2.7	14	ug/Kg	<MDL	133.	5.1	4		0-150	133.	4	3		0-150	29
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	133.	87	65		23-103	133.	85.6	64		23-103	2
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	133.	95	71		24-142	133.	91.7	69		24-142	3
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	133.	81	61		5-115	133.	81.6	61		5-115	0
Naphthalene	14	28	ug/Kg	<MDL	133.	83.3	62		12-97	133.	82.8	62		12-97	0
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	133.	75.5	57		6-97	133.	76.1	57		6-97	0
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	133	103	77		48-132	133.	102	77		48-132	0
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	133.	33	25		0-117	133.	28	21		0-117	17
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	133.	100	75		26-153	133.	96.3	72		26-153	4

Matrix Spike Duplicate Report
MSD:WG68555-4 MS:WG68555-3 L28052-3 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Matrix Spike Duplicate, Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit	Truevalue	MSD Value	% Rec.	Qual	LabLimit	RPD
2-Chloronaphthalene	16	32	ug/Kg	<MDL	133.	89.7	67		26-111	133.	86.7	65		26-111	3
Acenaphthylene	15	30	ug/Kg	<MDL	133.	101	76		27-132	133.	97.8	73		27-132	4
Dimethyl Phthalate	11	22	ug/Kg	<MDL	133.	110	83		13-162	133.	109	82		13-162	1
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	133.	128	96		3-183	133.	126	94		3-183	2
Acenaphthene	7	14	ug/Kg	<MDL	133.	96.7	73		25-130	133.	94.4	71		25-130	3
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	133.	88.2	66		18-134	133.	76.2	57		18-134	15
4-Nitrophenol	13	26.7	ug/Kg	<MDL	133.	112	84		45-153	133.	88.9	67		45-153	23
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	133.	130	98		27-166	133.	123	92		27-166	6
Fluorene	13	26	ug/Kg	<MDL	133.	109	82		22-147	133.	106	79		22-147	4
Diethyl Phthalate	6	12	ug/Kg	<MDL	133.	122	92		31-150	133.	120	90		31-150	2
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	133.	104	78		25-139	133.	102	77		25-139	1
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	133.	120	90		40-145	133.	115	86		40-145	5
N-Nitrosodiphenylamine	20	40	ug/Kg	<MDL	133.	94.7	71		4-169	133.	91.3	68		4-169	4
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	133.	110	82		16-162	133.	112	84		16-162	2
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	133.	116	87		30-146	133.	114	86		30-146	1
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	133.	106	80		18-151	133.	107	80		18-151	0
Pentachlorophenol	5	10	ug/Kg	<MDL	133.	108	81		17-170	133.	102	77		17-170	5
Phenanthrene	4	8	ug/Kg	8.27	133.	107	74		0-202	133.	112	78		0-202	5
Anthracene	4	8	ug/Kg	<MDL	133.	104	78		0-181	133.	105	79		0-181	1
Di-N-Butyl Phthalate	5	10	ug/Kg	8.4	133.	135	95		3-194	133.	135	95		3-194	0
Fluoranthene	8	16	ug/Kg	21.9	133.	124	76		12-188	133.	121	75		12-188	1
Pyrene	4	8	ug/Kg	19.5	133.	136	88		20-174	133.	133	85		20-174	3
Benzyl Butyl Phthalate	6	12	ug/Kg	17.8	133.	141	92		41-145	133.	140	92		41-145	0
Benzo(a)anthracene	2	4	ug/Kg	7.28	133.	122	86		32-168	133.	123	87		32-168	1
Chrysene	4	8	ug/Kg	11.3	133.	112	76		14-184	133.	107	72		14-184	5
3,3'-Dichlorobenzidine	2.7	26.7	ug/Kg	<MDL	133.	3.4	3		0-43	133.	2.9	2		0-43	40
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	43.5	133.	157	85		0-189	133.	158	86		0-189	1
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	133.	155	116		52-151	133.	153	115		52-151	1
Benzo(b)fluoranthene	3	6	ug/Kg	13.4	133.	114	75		0-199	133.	116	77		0-199	3
Benzo(k)fluoranthene	3	6	ug/Kg	11.1	133.	137	95		0-192	133.	134	92		0-192	3
Benzo(a)pyrene	3	6	ug/Kg	10.9	133.	110	74		0-215	133.	108	73		0-215	1
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	133.	115	86		2-177	133.	116	87		2-177	1
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	133.	117	88		4-166	133.	117	88		4-166	0
Benzo(g,h,i)perylene	8	16	ug/Kg	<MDL	133.	117	88		4-173	133.	115	86		4-173	2
Aniline	130	267	ug/Kg	<MDL	133.	<MDL	0	*	2-67	133.	<MDL	0	*	2-67	
Benzyl Alcohol	6	12	ug/Kg	<MDL	133.	84.7	64		0-138	133.	87.8	66		0-138	3
2-Methylphenol	19	38	ug/Kg	<MDL	133.	55.4	42		6-142	133.	48.4	36		6-142	15
4-Methylphenol	16	32	ug/Kg	<MDL	133.	59.8	45		0-163	133.	54.8	41		0-163	9
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	133.	<MDL	0		0-49	133.	<MDL	0		0-49	
Benzoic Acid	27	133	ug/Kg	36	133.	110	53		0-158	133.	110	53		0-158	0
2-Methylnaphthalene	14	28	ug/Kg	<MDL	133.	87.7	66		22-112	133.	89.5	67		22-112	2
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	133.	108	81		23-166	133.	107	80		23-166	1
2-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	107	81		62-89	133.	108	81		62-89	0
3-Nitroaniline	8	26.7	ug/Kg	<MDL	133.	10	8		0-52	133.	16	12		0-52	40
Dibenzofuran	14	28	ug/Kg	<MDL	133.	101	76		21-134	133.	97.6	73		21-134	4
4-Nitroaniline	13	26.7	ug/Kg	<MDL	133.	33.7	25		6-88	133.	35.8	27		6-88	8
Carbazole	7	14	ug/Kg	<MDL	133.	109	82		16-205	133.	108	81		16-205	1
Coprostanol	14	28	ug/Kg	22	1330	1350	99		0-183	1330	1330	98		0-183	1
Caffeine	6	12	ug/Kg	<MDL	133.	110	82		17-195	133.	102	76		17-195	8

SRM:WG68555-5 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	QA1Limit	Qual	LabLimit
Naphthalene	130	2800	ug/Kg	1630	230	14	G	80-120		0-29
Phenanthrene	400	800	ug/Kg	5200	3430	66	G	80-120		51-106
Anthracene	400	800	ug/Kg	1750	690	39	G	80-120		28-98
Fluoranthene	800	1600	ug/Kg	8800	6490	74	G	80-120		45-126
Pyrene	400	800	ug/Kg	9570	7340	77	G	80-120		36-135
Benzo(a)anthracene	200	400	ug/Kg	4660	3560	76	G	80-120		66-124
Chrysene	400	800	ug/Kg	4800	3910	82		80-120		77-136
Benzo(b)fluoranthene	300	600	ug/Kg	3820	3180	83		80-120		52-190
Benzo(k)fluoranthene	300	600	ug/Kg	2270	3010	133	L	80-120		60-146
Benzo(a)pyrene	300	600	ug/Kg	4240	2950	70	G	80-120		60-116
Indeno(1,2,3-Cd)Pyrene	900	1800	ug/Kg	2740	1700	61	G	80-120		33-121
Dibenzo(a,h)anthracene	270	1400	ug/Kg	419.	480	115		80-120		10-238
Benzo(g,h,i)perylene	800	1600	ug/Kg	2800	1930	69	G	80-120		15-121

LD:WG68555-6 L28052-4 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	QA1Limit
N-Nitrosodimethylamine	130	267	ug/Kg	<MDL	<MDL			100
Phenol	9	18	ug/Kg	<MDL	<MDL			100
Bis(2-Chloroethyl)Ether	15	30	ug/Kg	<MDL	<MDL			100
2-Chlorophenol	8	16	ug/Kg	<MDL	<MDL			100
1,3-Dichlorobenzene	.26	.53	ug/Kg	<MDL	<MDL			100
1,4-Dichlorobenzene	.13	.264	ug/Kg	.48	.587	20		100
1,2-Dichlorobenzene	.26	.53	ug/Kg	<MDL	<MDL			100
Bis(2-Chloroisopropyl)Ether	15	30	ug/Kg	<MDL	<MDL			100
N-Nitrosodi-N-Propylamine	9	18	ug/Kg	<MDL	<MDL			100
Hexachloroethane	15	30	ug/Kg	<MDL	<MDL			100
Nitrobenzene	16	32	ug/Kg	<MDL	<MDL			100
Isophorone	19	38	ug/Kg	<MDL	<MDL			100
2-Nitrophenol	15	30	ug/Kg	<MDL	<MDL			100
2,4-Dimethylphenol	7	14	ug/Kg	<MDL	<MDL			100
Bis(2-Chloroethoxy)Methane	17	34	ug/Kg	<MDL	<MDL			100
2,4-Dichlorophenol	16	32	ug/Kg	<MDL	<MDL			100
1,2,4-Trichlorobenzene	.26	.53	ug/Kg	<MDL	<MDL			100
Naphthalene	14	28	ug/Kg	<MDL	<MDL			100
Hexachlorobutadiene	.75	1.5	ug/Kg	<MDL	<MDL			100
4-Chloro-3-Methylphenol	13	26.7	ug/Kg	<MDL	<MDL			100
Hexachlorocyclopentadiene	27	133	ug/Kg	<MDL	<MDL			100
2,4,6-Trichlorophenol	13	26	ug/Kg	<MDL	<MDL			100
2-Chloronaphthalene	16	32	ug/Kg	<MDL	<MDL			100
Acenaphthylene	15	30	ug/Kg	<MDL	<MDL			100
Dimethyl Phthalate	11	22	ug/Kg	<MDL	<MDL			100
2,6-Dinitrotoluene	10	20	ug/Kg	<MDL	<MDL			100
Acenaphthene	7	14	ug/Kg	<MDL	<MDL			100
2,4-Dinitrophenol	13	26.7	ug/Kg	<MDL	<MDL			100
4-Nitrophenol	13	26.7	ug/Kg	<MDL	<MDL			100
2,4-Dinitrotoluene	3	6	ug/Kg	<MDL	<MDL			100
Fluorene	13	26	ug/Kg	<MDL	<MDL			100
Diethyl Phthalate	6	12	ug/Kg	<MDL	<MDL			100

LD:WG68555-6 L28052-4 Matrix: SALTWTRSED Listtype: ORBNALLFULL Method: EPA 3550B/8270C (7-3-01-004) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	QAlLimit
4-Chlorophenyl Phenyl Ether	13	26	ug/Kg	<MDL	<MDL			100
4,6-Dinitro-O-Cresol	13	26.7	ug/Kg	<MDL	<MDL			100
N-Nitrosodiphenylamine	20	40	ug/Kg	<MDL	<MDL			100
1,2-Diphenylhydrazine	10	20	ug/Kg	<MDL	<MDL			100
4-Bromophenyl Phenyl Ether	9	18	ug/Kg	<MDL	<MDL			100
Hexachlorobenzene	.66	1.33	ug/Kg	<MDL	<MDL			100
Pentachlorophenol	5	10	ug/Kg	<MDL	<MDL			100
Phenanthrene	4	8	ug/Kg	18.5	7.9	80		100
Anthracene	4	8	ug/Kg	<MDL	<MDL			100
Di-N-Butyl Phthalate	5	10	ug/Kg	10.6	10.4	2		100
Fluoranthene	8	16	ug/Kg	37.9	15	86		100
Pyrene	4	8	ug/Kg	34.7	15.2	78		100
Benzyl Butyl Phthalate	6	12	ug/Kg	11	11			100
Benzo(a)anthracene	2	4	ug/Kg	16.6	5.95	94		100
Chrysene	4	8	ug/Kg	29.5	8.93	107	E	100
3,3'-Dichlorobenzidine	13	26.7	ug/Kg	<MDL	<MDL			100
Bis(2-Ethylhexyl)Phthalate	6.7	14	ug/Kg	53	41.7	24		100
Di-N-Octyl Phthalate	8	16	ug/Kg	<MDL	<MDL			100
Benzo(b)fluoranthene	3	6	ug/Kg	16.7	10.2	49		100
Benzo(k)fluoranthene	3	6	ug/Kg	16.6	8.05	69		100
Benzo(a)pyrene	3	6	ug/Kg	14.3	7.89	58		100
Indeno(1,2,3-Cd)Pyrene	9	18	ug/Kg	<MDL	<MDL			100
Dibenzo(a,h)anthracene	7	14	ug/Kg	<MDL	<MDL			100
Benzo(g,h,i)perylene	8	16	ug/Kg	8.9	<MDL			100
Aniline	130	267	ug/Kg	<MDL	<MDL			100
Benzyl Alcohol	6	12	ug/Kg	<MDL	<MDL			100
2-Methylphenol	19	38	ug/Kg	<MDL	<MDL			100
4-Methylphenol	16	32	ug/Kg	<MDL	<MDL			100
4-Chloroaniline	2.7	5.33	ug/Kg	<MDL	<MDL			100
Benzoic Acid	27	133	ug/Kg	33	39			100
2-Methylnaphthalene	14	28	ug/Kg	<MDL	<MDL			100
2,4,5-Trichlorophenol	12	24	ug/Kg	<MDL	<MDL			100
2-Nitroaniline	13	26.7	ug/Kg	<MDL	<MDL			100
3-Nitroaniline	13	26.7	ug/Kg	<MDL	<MDL			100
Dibenzofuran	14	28	ug/Kg	<MDL	<MDL			100
4-Nitroaniline	13	26.7	ug/Kg	<MDL	<MDL			100
Carbazole	7	14	ug/Kg	<MDL	<MDL			100
Coprostanol	14	28	ug/Kg	<MDL	23			100
Caffeine	6	12	ug/Kg	<MDL	<MDL			100

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 05/29/03 02:31
Run ID: R93916 Workgroup: WG68555 (BS#131 bnallfull)

Sample #	2-Fluorophenol	d5-Phenol	d5-Nitrobenzene	d4-2-Chlorophenol	d4-1,2-Dichlorobenzene	2-Fluorobiphenyl	2,4,6-Tribromophenol	d14-Terphenyl
(Lab Limits)	0-112	10-106	28-94	11-105	24-91	31-101	29-112	51-130
L28052-1	69	67	79	71	49	79	99	97
L28052-2	71	67	79	71	49	79	96	101
L28052-3	69	61	75	66	49	70	91	101
L28052-4	60	57	67	59	43	66	81	98
L28052-5	71	67	80	71	50	78	93	95
L28052-6	69	64	76	67	47	78	96	99
L28052-7	66	58	73	64	47	70	87	106
L28052-8	62	58	79	62	53	71	70	101
WG68555-1	61	51	65	56	47	61	68	105
WG68555-2	62	59	71	59	54	63	80	98
WG68555-3	70	64	71	63	54	67	78	97
WG68555-4	66	62	71	61	54	66	71	95
WG68555-5	67	61	75	65	49	72	73	83
WG68555-6	63	57	70	60	46	67	75	101

(QA1 Limits)		50-150(Acids)	50-150(Base Neutrals)					
L28052-1		avg=77	avg=76					
L28052-2		avg=76	avg=77					
L28052-3		avg=72	avg=74					
L28052-4		avg=64	avg=69					
L28052-5		avg=76	avg=76					
L28052-6		avg=74	avg=75					
L28052-7		avg=69	avg=74					
L28052-8		avg=63	avg=76					
WG68555-1		avg=59	avg=70					
WG68555-2		avg=65	avg=72					
WG68555-3		avg=69	avg=72					
WG68555-4		avg=65	avg=72					
WG68555-5		avg=67	avg=70					
WG68555-6		avg=64	avg=71					

Definition of QA1 Qualifiers

QA1 Qualifiers are based upon QA1 Limits and are applied to the QC and the associated data.

B is applied to a sample parameter result when the analyte was detected at a concentration at or greater than the MDL in the associated batch method blank.

E indicates that for a given parameter the precision (RPD) for the sample/lab duplicate exceeded 100%.

X indicates potentially low biased data wherein the true analyte concentration may be greater than the reported value based on any of the following situations: the surrogate or the matrix spike recovery is less than 10%.

G indicates potentially low biased data wherein the true analyte concentration may be greater than the reported value based on any of the following situations: the surrogate recovery is above 10% but less than 50%, the matrix spike recovery is above 10% but less than 50%, or the standard reference material recovery is above 10% but less than 80%.

L indicates potentially high biased data wherein the true analyte concentration may be lower than the reported value based on any of the following situations: the surrogate recovery is greater than 150%, the matrix spike recovery is greater than 150%, or the standard reference material recovery is greater than 120%.

Please note that for BNA analyses, acid and base/neutral surrogates are averaged and the averages are compared to the QA1 Limits for the appropriate qualifiers to be applied to the corresponding parameters. For chlorinated pesticide/PCB analyses, organophosphorus pesticides, fuel analyses, and butyltin analyses, all surrogates must be outside the QA1 Limits for the qualifiers to be applied. For volatile analyses only one surrogate need be outside the QA1 Limits for qualifiers to be applied to the corresponding parameters. No QA1 qualifiers are applied to the fuel screen test WTPH-HCID. Please see Appendix C-QC Calculations.doc for all details.

Laboratory Qualifiers are based upon statistically derived laboratory limits that are generated from matrix matched empirical recovery or replicate results. The laboratory limits reflect the nominal performance of a method for a given matrix and are applied only to the QC results.

An asterisk (*) is applied to any QC result that is outside of laboratory method limits.

1:1 Acetone: $MeCl_2$

SOLID AND TISSUE SAMPLE EXTRACTION RECORD FOR BNA ANALYSIS
TRACE ORGANICS LABORATORY

BNA surrogate #760 140

QC BATCH NO.: BS 131

BNA LL FULL

WORKGROUP NO.: WG 68 555

EPA SW-846 EXTRACTION METHOD:

BNA SURROGATE SPIKE I.D.#: 676

SONICATION EPA 3550 SOXHLET EPA 3540

BNA MATRIX SPIKE I.D.#: 678 A was surrogate

Date/ Analyst	Sample Number	Project Number	Sample Description	coc	Init. Amt (g)	Spike Amount (uL)	Vf (mL)	Clean-ups (GPC)	Conc Anal.	Turn Over Date	Comments
4/30/03 GW/LM	WG68555-1	QC	MB		30.0	676-100uL	0.5		GW	5/1/03	reextracted 5/20/03
	-2		SB			~~676 100uL GW~~ 678A-100uL					due to LD failure
	-3		MS (L28052-3)								LM vialed on 5/22/03
	-4		MSD								
	-5		SRM 1944		3.0	760-100uL	5.0				
	-6		LD (L28052-4)		30.0	~~760~~ 676-100uL	0.5				
	L28052-1	423056-160	Norfolk clean-up								
	-2										
	-3										
	-4										
	-5										
	-6										
	-7										
	-8										

GPC SAMPLE LOG

Date	Sample #	Project #	Method	Inject Vol.	Dump Time	Collect Time	Wash Time	Analyst	Comments
5/21/03	calib	A23056-160	BNA	8.0 mL	20:00 min	28:00 min	6:00 min	GW	20°C
	WG68555-1								
	-2								
	-3								
	-4		"						
	-5								
	-6								
	L28052-1								
	-2								
	-3								
	-4								
	-5								
	-6								
	-7								
	-8								
	WG -1	A21298							
	-2								
	-3								
	-4								
	L28286-1								
	-2								

GPC SAMPLE LOG

Date	Sample #	Project #	Method	Inject Vol.	Dump Time	Collect Time	Wash Time	Analyst	Comments
4/30/03	calib	423056-160	B/NA	8.0 ml	19:00 min	28:00 min	6:00 min	LM/GW	21 °C
	~~L28052~~ WG 68555-1								
	-2								
	-3								
	-4								
	-5								
	-6								
	L28052-1								
	-2								
	-3								
	-4								
	-5								
	-6								
	-7								
	-8								
5/08/03	calib	421085	P/P	8.0 ml	27:00 min	20:00 min	6:00 min	LM/GW	21 °C
	WG 68696-1								
	-2								
	-3								
	-4								
	L28008-1								
	-2								

Batch: /chem/6890j.i/030522.b

#	Smp. #	Injection Time	Wkgp. #	QC #	Project #	Sample Description	Matrix	Amount	DilFac	IS#2-RT	IS#2-Area	Method	Init Cali	Analyst
1	INST-01	22-MAY-2003 09:47	030522	030522	421195	INSTRUMENT BLANK	SOIL	0.000	1.0	0.000	0	8270b.m	03-MAY-2003	M.Doubrava
2	INST-02	22-MAY-2003 10:35	030522	030522	421195	INSTRUMENT BLANK ISTD	SOIL	0.000	1.0	10.234	537389	8270b.m	03-MAY-2003	M.Doubrava
3	DFTPP-01	22-MAY-2003 11:24	030522	030522		10 NG DFTPP	NONE	0.000	1.0	13.748	68496	dftpp.m		M.Doubrava
4	CCALI-01	22-MAY-2003 12:08	030522	030522	421195	SS#732 D 6.00 PPM BNA	SOIL	0.000	1.0	7.742	943124	8270b.m	03-MAY-2003	M.Doubrava
5	INST-03	22-MAY-2003 13:00	030522	030522	421195	INSTRUMENT BLANK ISTD	SOIL	0.000	1.0	0.000	0	8270b.m	03-MAY-2003	M.Doubrava
6	WG68555-1	22-MAY-2003 13:52	WG68555	BS#131	423056-16	WG68555-1 MB NORFOLK	SOIL	18.750	0.5	7.742	703808	8270b.m	03-MAY-2003	M.Doubrava
7	WG68555-2	22-MAY-2003 14:47	WG68555	BS#131	423056-16	WG68555-2 SB NORFOLK	SOIL	18.750	0.5	10.239	558915	8270b.m	03-MAY-2003	M.Doubrava
8	WG68555-3	22-MAY-2003 15:41	WG68555	BS#131	423056-16	WG68555-3 MS L28052-3 NORFOL	SOIL	18.750	0.5	10.234	500330	8270b.m	03-MAY-2003	M.Doubrava
9	WG68555-4	22-MAY-2003 16:35	WG68555	BS#131	423056-16	WG68555-4 MSD L28052-3 NORFO	SOIL	18.750	0.5	10.234	453596	8270b.m	03-MAY-2003	M.Doubrava
10	WG68555-6	22-MAY-2003 17:30	WG68555	BS#131	423056-16	WG68555-6 LD L28052-4 NORFOL	SOIL	18.750	0.5	7.742	769065	8270b.m	03-MAY-2003	M.Doubrava
11	L28052-3	22-MAY-2003 18:24	WG68555	BS#131	423056-16	L28052-3 NORFOLK CLEANUP	SOIL	18.750	0.5	7.742	762888	8270b.m	03-MAY-2003	M.Doubrava
12	L28052-4	22-MAY-2003 19:18	WG68555	BS#131	423056-16	L28052-4 NORFOLK CLEANUP	SOIL	18.750	0.5	7.742	958681	8270b.m	03-MAY-2003	M.Doubrava
13	WG68555-5	22-MAY-2003 20:10	WG68555	BS#131	423056-16	WG68555-5 SRM 1944	SOIL	1.875	5.0	7.742	806323	8270b.m	03-MAY-2003	M.Doubrava
14	L28052-1	22-MAY-2003 21:01	WG68555	BS#131	423056-16	L28052-1 NORFOLK CLEANUP	SOIL	18.750	0.5	7.742	607234	8270b.m	03-MAY-2003	M.Doubrava
15	L28052-2	22-MAY-2003 21:54	WG68555	BS#131	423056-16	L28052-2 NORFOLK CLEANUP	SOIL	18.750	0.5	7.747	768863	8270b.m	03-MAY-2003	M.Doubrava
16	L28052-5	22-MAY-2003 22:45	WG68555	BS#131	423056-16	L28052-5 NORFOLK CLEANUP	SOIL	18.750	0.5	7.747	799660	8270b.m	03-MAY-2003	M.Doubrava
17	L28052-6	22-MAY-2003 23:33	WG68555	BS#131	423056-16	L28052-6 NORFOLK CLEANUP	SOIL	18.750	0.5	7.747	676331	8270b.m	03-MAY-2003	M.Doubrava
18	L28052-7	23-MAY-2003 00:21	WG68555	BS#131	423056-16	L28052-7 NORFOLK CLEANUP	SOIL	18.750	0.5	7.747	858334	8270b.m	03-MAY-2003	M.Doubrava
19	L28052-8	23-MAY-2003 01:09	WG68555	BS#131	423056-16	L28052-8 NORFOLK CLEANUP	SOIL	18.750	0.5	7.747	953269	8270b.m	03-MAY-2003	M.Doubrava
20	INST-04	23-MAY-2003 01:57	030522	030522	421195	INSTRUMENT BLANK ISTD	SOIL	0.000	1.0	10.239	621992	8270b.m	03-MAY-2003	M.Doubrava
21	DFTPP-02	23-MAY-2003 02:45	030522	030522		10 NG DFTPP	NONE	0.000	1.0	13.748	92616	dftpp.m		M.Doubrava
22	CCALI-02	23-MAY-2003 03:27	030522	030522	421195	SS#732 D 6.00 PPM BNA	SOIL	0.000	1.0	7.747	935713	8270b.m	03-MAY-2003	M.Doubrava

Samples: 9 QC Samples + Misc.: 10 ContinuingCals: 1 Tunes: 2 Calibrations: 0

Sequence Name: C:\MSDCHEM\1\SEQUENCE\030522.S
Comment:
Operator: M.Doubrava
Data Path: C:\MSDchem\1\data\030512\
Pre-Seq Cmd:
Post-Seq Cmd:

Method Sections To Run
(X) Full Method
( ) Reprocessing Only

On A Barcode Mismatch
(X) Inject Anyway
( ) Don't Inject

Line	Type	Vial	DataFile	Method	Sample Name
1	Blank	1	INST-01	8270B	INSTRUMENT BLANK
2	Blank	2	INST-02	8270B	INSTRUMENT BLANK ISTD
3	Blank	3	DFTPP-01	DFTPP	10 NG DFTPP
4	DailyCal	4	CCALI-01	8270B	SS#732 D 6.00 PPM BNA
5	Blank	5	INST-03	8270B	INSTRUMENT BLANK ISTD
6	Blank	6	68555-1	8270B	WG68555-1 MB NORFOLK
7	Spike	7	68555-2	8270B	WG68555-2 SB NORFOLK
8	Spike	8	68555-3	8270B	WG68555-3 MS L28052-3 NORFOLK
9	Spike	9	68555-4	8270B	WG68555-4 MSD L28052-3 NORFOL
10	Spike	10	68555-6	8270B	WG68555-6 LD L28052-4 NORFOLK
11	Sample	11	28052-3	8270B	L28052-3 NORFOLK CLEANUP
12	Sample	12	28052-4	8270B	L28052-4 NORFOLK CLEANUP
13	Spike	13	68555-5	8270B	WG68555-5 SRM 1944
14	Sample	14	28052-1	8270B	L28052-1 NORFOLK CLEANUP
15	Sample	15	28052-2	8270B	L28052-2 NORFOLK CLEANUP
16	Sample	16	28052-5	8270B	L28052-5 NORFOLK CLEANUP
17	Sample	17	28052-6	8270B	L28052-6 NORFOLK CLEANUP
18	Sample	18	28052-7	8270B	L28052-7 NORFOLK CLEANUP
19	Sample	19	28052-8	8270B	L28052-8 NORFOLK CLEANUP
20	Blank	2	INST-04	8270B	INSTRUMENT BLANK ISTD
21	Blank	3	DFTPP-02	DFTPP	10 NG DFTPP
22	Sample	4	CCALI-02	8270B	SS#732 D 6.00 PPM BNA

CORRECTIVE ACTION FORM

Date Occurred: 5/12/03
Date Recognized: 5/25/03
Reported by: [illegible]

WG#: WG68555
Batch#: BS7131
Project#: 423056
Sample#(s): L28052-7
L28052-8

Method: ☒BNA ☐CLPESTPCB ☐VOA-GCMS
☐ NWTPH-HCID ☐NWTPH-DX ☐NWTPH-GX
☐ HERB ☐OPPEST ☐BUTYL TIN
☐BNA-LVI ☐AIRTOX ☐ _____

Matrix: ☐Liquid ☒Solid ☐ Air ☐Tissue

Instrument: GCMS: HP6890 ☐A ☐B ☐C ☐D ☐E ☒J ☐___
GC: HP6890 ☐F ECD ☐G ECD ☐H FID ☐H OI4450PID/FID
☐I FID ☐_____
Other: ☐Extraction ☐GPC ☐_____

Type of Occurence:

☐ Out of control values: ☐ Surrogate Recoveries ☐ MS/MSD/Blank spike Recoveries ☐ Blank Contamination
☐ MS/MSD RPDs ☐ Continuing Calibration Checks
☒ Performance Checks ☐ Initial Calibration
☐ Sample/LD RPDs ☐ SRM ☐ Other
☐ Holding time exceeded by ___ days.

Explaination: (include out of control values and associated limits, if applicable)
Samples L28052-7, L28052-8 exceeded 12 hr DFTPP-01. DFTPP-02 analyzed at the end of sequence was in tune. Cal.-02 analyzed at the end of sequence was within QA/QC continuing requirements

☐ See QAQC Summary Sheet Batch #_____ for values and limits.

Corrective Action:

☐ Sample(s) processed "AS IS" ☐ Sample(s) reanalyzed ☒ Sample(s) reextracted and reanalyzed
☐ Other: _____
WG68555 originally extracted on 4/30/03. Set was reextracted on 5/20/03 due to LD failure

Are there any impacts on the data? _____

Signatures: :
Analyst: [signature] Date: 5/30/03
QA Officer (for QA1 Projects): _____ Date: _____
Reviewer: [signature] Date: 6/9/2003
Supervisor: [signature] Date: 6/9/2003

Semi-Volatile Mass Spectroscopy Completion Sheet

WG#s: WG68555 **Batch#s:** BS#131

Analysis Date: 5/22/03

Instrument: HP6890 5 ☒ Full Scan ☐ SIM

Methods: ☐ BNA ☐ BNA-SUR ☐ BN-LVI ☐ A-LVI ☒ BNALL
☐ OPPEST ☐ BUTYLTINS ☐ Other: _____

Matrices: ☐ Liquids ☐ Solids ☐ Tissues ☐ Calibration ☐ Other: _____

Instrument File Information Folder:
- ☒ Injection Log
- ☒ Tune
- ☒ Initial Calibration Curve
- ☒ Continuing Calibration/Check Standards
- ☐ Instrument method (calibration file only)
- ☐ LVI curve/continuing qualifiers (if necessary)
- ☒ Raw data reports/chromatograms/mass spectra
- ☒ SEED3 Reports
- ☒ Sequence Report

TC* Package:
- ☐ QC Report
- ☐ WKGP Sheet
- ☐ Extraction Sheet
- ☐ Dilution Log (if necessary)
- ☐ Corrective Action Form
- ☐ Injection Log
- ☐ SEED3 Reports
- ☐ GPC log (QA2 only)

* (If TC = Diane, please place WKGP sheet on top)

Information Folder (may be part of instrument file folder):
- ☒ QC Report
- ☒ WKGP Sheet
- ☒ Extraction Sheet
- ☐ Dilution Log (if necessary)
- ☒ Corrective Action Form
- ☒ Injection Log
- ☒ GPC log (QA2 only)

QC Package:
- ☐ QC Report
- ☐ WKGP Sheet
- ☐ Extraction Sheet
- ☐ Dilution Log (if necessary)
- ☐ Corrective Action Form
- ☐ Injection Log
- ☐ GPC log (QA2 only)

Reviewed	Yes	No	N/A	CAF	
☒	☒	☐	☐	☐	Tune passed SOP criteria
☒	☐	☐	☒	☒	Samples run within 12 hours shift → See CA.
☒	☒	☐	☐	☐	Initial calibration meets method SCC/CCC SOP criteria
☒	☒	☐	☐	☐	Continuing calibration meets method SCC/CCC SOP criteria
☒	☒	☐	☐	☐	ISTD area counts meets method SOP criteria
☒	☒	☐	☐	☐	Correct extraction/dilution information
☒	☒	☐	☐	☐	Correct surrogate/matrix spike true values
☒	☒	☐	☐	☐	Correct project QC limits applied (STD/QA1)
☒	☒	☐	☐	☐	Correct project blank/QA1/LVI qualifiers applied
☒	☒	☐	☐	☐	CAF addresses QC anomalies (when necessary)
☒	☒	☐	☐	☐	Independent check standard run with initial calibration

Other: _____

Analyst: [signature] **Date:** 5/30/03

Reviewer: Dana M. Walker **Date:** 6/9/2003

Moved to EDS: _____ **Date:** _____

METRO Environmental Laboratory

WORK GROUP REPORT (wk02)

Apr 30 2003, 10:37 am

Work Group: WG68515 (PPS#275-pcbll) for Department: 7 - Organics, Trace

Created: 29-APR-03 Due: Operator: gw/lm

mple	Project Number	Project Description	PKey	C	Product	Matrix	Stat	UA	Workdate	Duedate
L28052-1	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
L28052-2	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
8052-3	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
8052-4	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
8052-5	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
L28052-6	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
L28052-7	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
8052-8	423056-160	Norfolk Cleanup Study	SED	S	PCBLL	SALTWTRSED	PREP	U	07-MAY-03	07-JUN-03
68515-1	MB			S	PCBLL	OTHR SOLID	PREP	U	29-APR-03	
WG68515-2	SB			S	PCBLL	OTHR SOLID	PREP	U	29-APR-03	
WG68515-3	MS		SED	S	PCBLL	SALTWTRSED	PREP	U	29-APR-03	
WG68515-4	MSD		SED	S	PCBLL	SALTWTRSED	PREP	U	29-APR-03	
68515-5	LD		SED	S	PCBLL	SALTWTRSED	PREP	U	29-APR-03	
68515-6	SRM		SED	S	PCBLL	SALTWTRSED	PREP	U	29-APR-03	

Comments:

8052-1	3 - 1/2 Grab Composite, 0 - 2 cm
8052-2	3 - 1/2 Grab Composite, 0 - 10 cm
L28052-3	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-4	3 - 1/2 Grab Composite, 0 - 10 cm
8052-5	3 - 1/2 Grab Composite, 0 - 2 cm
8052-6	3 - 1/2 Grab Composite, 0 - 10 cm
8052-7	3 - 1/2 Grab Composite, 0 - 2 cm
L28052-8	3 - 1/2 Grab Composite, 0 - 10 cm
WG68515-1	MB030429
68515-2	WG68515-1
68515-3	L28052-4
WG68515-4	WG68515-3 L28052-4
WG68515-5	L28052-3
WG68515-6	HS2

A/M
6/8/03

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 06/04/03 03:14
Run ID: R94478 Workgroup: WG68515 (PPS#275-pcbll)

MB:WG68515-1 Matrix: OTHR SOLID Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Qual
Aroclor 1016	2	4	ug/Kg	<MDL	
Aroclor 1221	4	8	ug/Kg	<MDL	
Aroclor 1232	4	8	ug/Kg	<MDL	
Aroclor 1242	2	4	ug/Kg	<MDL	
Aroclor 1248	2	4	ug/Kg	<MDL	
Aroclor 1254	2	4	ug/Kg	<MDL	
Aroclor 1260	2	4	ug/Kg	<MDL	

SB:WG68515-2 MB:WG68515-1 Matrix: OTHR SOLID Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Spike Blank, Method Blank)

Parameter	Mdl	Rdl	Units	MB Value	Truevalue	SB Value	% Rec.	Qual	LabLimit
Aroclor 1016	2	4	ug/Kg	<MDL	30.0	22	73		35-111
Aroclor 1260	2	4	ug/Kg	<MDL	30.0	25.1	84		47-146

Matrix Spike Report
MS:WG68515-3 L28052-4 Matrix: SALTWTRSED Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: 423056-160 Pkey: SED
(Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	QA1Limit
Aroclor 1016	2	4	ug/Kg	<MDL	30.0	35.2	117		50-150
Aroclor 1260	2	4	ug/Kg	<MDL	30.0	25.7	86		50-150

Matrix Spike Duplicate Report
MSD:WG68515-4 MS:WG68515-3 L28052-4 Matrix: SALTWTRSED Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: 423056-160 Pkey: SED
(Matrix Spike Duplicate, Matrix Spike)

Parameter	Mdl	Rdl	Units	SampValue	Truevalue	MS Value	% Rec.	Qual	LabLimit	Truevalue	MSD Value	% Rec.	Qual	LabLimit	RPD
Aroclor 1016	2	4	ug/Kg	<MDL	30.0	35.2	117		43-176	30.0	32.7	109		43-176	7
Aroclor 1260	2	4	ug/Kg	<MDL	30.0	25.7	86		13-198	30.0	25.5	85		13-198	1

LD:WG68515-5 L28052-3 Matrix: SALTWTRSED Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: 423056-160 Pkey: SED
(Lab Duplicate)

Parameter	Mdl	Rdl	Units	SampValue	LD Value	RPD	Qual	QA1Limit
Aroclor 1016	2	4	ug/Kg	<MDL	<MDL			100
Aroclor 1221	4	8	ug/Kg	<MDL	<MDL			100
Aroclor 1232	4	8	ug/Kg	<MDL	<MDL			100
Aroclor 1242	2	4	ug/Kg	<MDL	<MDL			100
Aroclor 1248	2	4	ug/Kg	<MDL	<MDL			100
Aroclor 1254	2	4	ug/Kg	<MDL	<MDL			100
Aroclor 1260	2	4	ug/Kg	<MDL	<MDL			100

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 06/04/03 03:14
Run ID: R94478 Workgroup: WG68515 (PPS#275-pcbll)

SRM:WG68515-6 Matrix: SALTWTRSED Listtype: ORPCBLL Method: EPA 8081A/8082 (7-3-03-002) Project: Pkey: SED
(Std Reference Material)

Parameter	Mdl	Rdl	Units	Truevalue	SRM Value	% Rec.	Qual	QA1Limit	Qual	LabLimit
Aroclor 1254	8	16	ug/Kg	112.	123	110		80-120		57-139

KING COUNTY METRO ENVIRONMENTAL LABORATORY
Lab QC Report - 06/04/03 03:14
Run ID: R94478 Workgroup: WG68515 (PPS#275-pcb11)

Sample #	2,4,5,6-Tetrachlo-ro-m-xylene	Decachlorobipheny-1
(Lab Limits)	35-144	43-160
L28052-1	92	96
L28052-2	93	90
L28052-3	85	97
L28052-4	76	92
L28052-5	92	97
L28052-6	96	100
L28052-7	72	93
L28052-8	76	97
WG68515-1	53	94
WG68515-2	61	104
WG68515-3	77	100
WG68515-4	77	102
WG68515-5	69	103
WG68515-6	91	103
(QA1 Limits)	50-150	50-150
L28052-1	92	96
L28052-2	93	90
L28052-3	85	97
L28052-4	76	92
L28052-5	92	97
L28052-6	96	100
L28052-7	72	93
L28052-8	76	97
WG68515-1	53	94
WG68515-2	61	104
WG68515-3	77	100
WG68515-4	77	102
WG68515-5	69	103
WG68515-6	91	103

Definition of QA1 Qualifiers

QA1 Qualifiers are based upon QA1 Limits and are applied to the QC and the associated data.

B is applied to a sample parameter result when the analyte was detected at a concentration at or greater than the MDL in the associated batch method blank.

E indicates that for a given parameter the precision (RPD) for the sample/lab duplicate exceeded 100%.

X indicates potentially low biased data wherein the true analyte concentration may be greater than the reported value based on any of the following situations: the surrogate or the matrix spike recovery is less than 10%.

G indicates potentially low biased data wherein the true analyte concentration may be greater than the reported value based on any of the following situations: the surrogate recovery is above 10% but less than 50%, the matrix spike recovery is above 10% but less than 50%, or the standard reference material recovery is above 10% but less than 80%.

L indicates potentially high biased data wherein the true analyte concentration may be lower than the reported value based on any of the following situations: the surrogate recovery is greater than 150%, the matrix spike recovery is greater than 150%, or the standard reference material recovery is greater than 120%.

Please note that for BNA analyses, acid and base/neutral surrogates are averaged and the averages are compared to the QA1 Limits for the appropriate qualifiers to be applied to the corresponding parameters. For chlorinated pesticide/PCB analyses, organophosphorus pesticides, fuel analyses, and butyltin analyses, all surrogates must be outside the QA1 Limits for the qualifiers to be applied. For volatile analyses only one surrogate need be outside the QA1 Limits for qualifiers to be applied to the corresponding parameters. No QA1 qualifiers are applied to the fuel screen test WTPH-HCID. Please see Appendix C-QC Calculations.doc for all details.

Laboratory Qualifiers are based upon statistically derived laboratory limits that are generated from matrix matched empirical recovery or replicate results. The laboratory limits reflect the nominal performance of a method for a given matrix and are applied only to the QC results.

An asterisk (*) is applied to any QC result that is outside of laboratory method limits.

Data File Name	Sample Name	Date Acquired	Vial Numb	Sample Amount	Sample Multiplie	Isodrin (RT)	Isodrin (Height)	Leptophos (RT)	Leptophos (Height)	Isodrin #2 (RT)	Isodrin #2 (Height)	Leptoph (RT)	Leptophos #2 (Height)	Misc Info	Data File Path
COND-1.D	Conditioner	6/2/2003 14:55	1	1	1										H:\HPCHEM\2\DATA\030602\
BLANK-1.D	Blank	6/2/2003 15:32	2	1	1										H:\HPCHEM\2\DATA\030602\
PCB-1.D	558D1 1016/1260 PCB 500PPB (DAILY C	6/2/2003 16:09	3	1	1	15.821	269240861	24.249	408471406	13.352	80772164	19.902	98727013		H:\HPCHEM\2\DATA\030602\
PCB-2.D	624C1 1248 PCB 500PPB (DAILY CAL)	6/2/2003 16:45	4	1	1	15.821	392687231	24.250	615586469	13.352	121051250	19.901	148188112		H:\HPCHEM\2\DATA\030602\
PCB-3.D	786.1 1254 PCB 500PPB (DAILY CAL)	6/2/2003 17:22	5	1	1	15.820	320771176	24.249	477634272	13.353	92257326	19.902	114170447		H:\HPCHEM\2\DATA\030602\
WG68515-1.D	MB	6/2/2003 17:59	6	12.5	1	15.821	283042608	24.251	432081453	13.354	77955420	19.903	96357273	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
WG68515-2.D	SB	6/2/2003 18:35	7	12.5	1	15.821	281367273	24.251	440096435	13.358	79864297	19.907	98926896	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
WG68515-3.D	MS L28052-4	6/2/2003 19:12	8	12.5	1	15.823	250658562	24.254	419724648	13.357	72557513	19.908	95926811	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
WG68515-4.D	MSD L28052-4	6/2/2003 19:49	9	12.5	1	15.823	252127811	24.253	415485790	13.357	73781799	19.908	95465690	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
WG68515-5.D	LD L28052-3	6/2/2003 20:25	10	12.5	1	15.823	263605946	24.253	440154556	13.357	76313525	19.908	97159660	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
WG68515-6.D	SRM HS2	6/2/2003 21:02	11	3.125	1	15.828	205333361	24.264	427329393	13.365	64212713	19.924	112638686	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
L28052-1.D	SEDS	6/2/2003 21:39	12	12.5	1	15.827	215411572	24.266	434334008	13.361	69198204	19.925	116581879	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
L28052-2.D	SEDS	6/2/2003 22:15	13	12.5	1	15.827	210301909	24.265	418663460	13.361	67744865	19.924	112803121	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
L28052-3.D	SEDS	6/2/2003 22:52	14	12.5	1	15.823	233656867	24.253	402463690	13.358	76640035	19.908	100525221	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
L28052-4.D	SEDS	6/2/2003 23:28	15	12.5	1	15.823	249093424	24.253	424283436	13.358	75907683	19.908	102092327	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
BLANK-2.D	Blank	6/3/2003 0:05	2	1	1										H:\HPCHEM\2\DATA\030602\
PCB-4.D	558D1 1016/1260 PCB 500PPB (DAILY C	6/3/2003 0:42	3	1	1	15.823	263022325	24.252	408716974	13.358	77283937	19.909	96455049		H:\HPCHEM\2\DATA\030602\
PCB-5.D	624C1 1248 PCB 500PPB (DAILY CAL)	6/3/2003 1:18	4	1	1	15.822	401378906	24.253	652621649	13.358	120947842	19.908	142936714		H:\HPCHEM\2\DATA\030602\
L28052-5.D	SEDS	6/3/2003 1:55	16	12.5	1	15.824	226399754	24.260	445217983	13.360	72345515	19.919	114130774	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
L28052-6.D	SEDS	6/3/2003 2:31	17	12.5	1	15.824	216997590	24.260	422787098	13.359	70666138	19.919	111962578	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
L28052-7.D	SEDS	6/3/2003 3:08	18	12.5	1	15.824	259532236	24.254	449880944	13.358	77840704	19.908	106756530	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
L28052-8.D	SEDS	6/3/2003 3:45	19	12.5	1	15.822	268606829	24.252	448468995	13.359	82445445	19.908	104030058	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030602\
BLANK-3.D	Blank	6/3/2003 4:21	2	1	1										H:\HPCHEM\2\DATA\030602\
PCB-6.D	558D1 1016/1260 PCB 500PPB (DAILY C	6/3/2003 4:58	3	1	1	15.822	269644672	24.252	416203575	13.358	80189643	19.910	99034254		H:\HPCHEM\2\DATA\030602\
PCB-7.D	786.1 1254 PCB 500PPB (DAILY CAL)	6/3/2003 5:34	5	1	1	15.822	330931423	24.253	510541673	13.358	97297472	19.908	114932355		H:\HPCHEM\2\DATA\030602\
					Ave.	15.823	269705349	24.255	452892757	13.358	81298738	19.910	108561974		
					Std. Dev.	0.002	53380427	0.005	65326420	0.003	15159660	0.007	14374768		
					%RSD		20%		14%		19%		13%		

Data File Name	Sample Name	Date Acquired	Vial Numbe	Sample Amount	Sample Multiplie	Isodrin (RT)	Isodrin (Height)	Leptophos (RT)	Leptophos (Height)	Isodrin #2 (RT)	Isodrin #2 (Height)	Leptoph (RT)	Leptophos #2 (Height)	Misc Info	Data File Path
COND-1.D	Conditioner	6/3/2003 11:28	1	1	1										H:\HPCHEM\2\DATA\030603\
BLANK-1.D	Blank	6/3/2003 12:05	2	1	1										H:\HPCHEM\2\DATA\030603\
PCB-1.D	624C1 1248 PCB 500PPB (DAILY CAL)	6/3/2003 12:41	4	1	1	15.823	425823242	24.253	666816500	13.359	125728281	19.908	145306699		H:\HPCHEM\2\DATA\030603\
PCB-2.D	786.1 1254 PCB 500PPB (DAILY CAL)	6/3/2003 13:18	5	1	1	15.822	343639089	24.251	514160468	13.359	99793154	19.909	116224513		H:\HPCHEM\2\DATA\030603\
L28052-6.D	SEDS 2X	6/3/2003 13:55	17	12.5	2	15.823	240220437	24.256	435889602	13.360	71442405	19.913	101392000	WG68515; PPS275 PCBLL; NORFOLK SOIL	H:\HPCHEM\2\DATA\030603\
PCB-3.D	624C1 1248 PCB 500PPB (DAILY CAL)	6/3/2003 14:31	4	1	1	15.822	406906558	24.251	670389856	13.359	127682771	19.907	147183695		H:\HPCHEM\2\DATA\030603\
					Ave.	15.823	354147332	24.253	571814106	13.359	105161653	19.909	127526727		
					Std. Dev.	0.001	83687380	0.002	116249798	0.000	26407041	0.003	22459503		
					%RSD		24%		20%		25%		18%		

1:1 Acetone : MeCl2

SOLID AND TISSUE SAMPLE EXTRACTION RECORD FOR PESTICIDE/PCB ANALYSIS
TRACE ORGANICS LABORATORY

QC BATCH NO.: PPS Z75

WORKGROUP NO.: WG 68515

EPA SW-846 EXTRACTION METHOD: PCB-LL

SONICATION EPA 3550 SOXHLET EPA 3540

PESTICIDE SURROGATE SPIKE I.D.#: 706

PCB ~~PESTICIDE~~ MATRIX SPIKE I.D.#: 705

Date/ Analyst	Sample Number	Project Number	Sample Description	coc	Init. Amt (g)	Spike Amount (uL)	Vf (mL)	Clean ups (GPC AL TBA H+)	Conc Anal.	Turn Over Date	Comments
4/29/03	WG 68515-1	QC	MB	SA	20.0	706-160µL	1.0		LM	4/30/03	
GW/LM	-2		SB			706-160µL 705-200µL					
	-3		MS (L28052-4)	SF							
	-4		MSD								
	-5		LD (L28052-3)			706-160µL					
	-6		SRM HS2		5.0						
	L28052-1	423056-160	Norfolk Cleanup		20.0						
	-2										L28052-2 a tiny bubbled during vortex
	-3										
	-4										
	-5										
	-6										
	-7										
	-8										