DELAWARE RIVER
MAIN CHANNEL DEEPENING PROJECT

- INTERIM REPORT –

KILLCOHOOK (CELLS 2 AND 3) CONFINED DISPOSAL FACILITY MONITORING AND REACH C WATER QUALITY MONITORING AT THE POINT OF DREDGING

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Contract No. W912BU-06-D-0003
Task Order Numbers 54 and 55

June 2010

EXECUTIVE SUMMARY

Dredging for the Delaware River Main Stem Channel Deepening Project began on March 1, 2010. The first construction contract is for Reach C of the channel, which extends from the Delaware Memorial Bridge to just below the Chesapeake and Delaware Canal. In conjunction with the dredging, environmental monitoring for potential water quality impacts is on-going at the Federally owned Killcohook dredged material containment facility and at the point of active dredging following a program coordinated with the Delaware Department of Natural Resources and Environmental Control (DNREC). This interim report presents environmental monitoring data for the deepening project collected up to May 17, 2010. Environmental monitoring efforts are continuing. A summary report presenting all data will be prepared subsequent to completion of the on-going work.

The Killcohook dredged material containment facility is comprised of three separate placement cells. Cells 2 and 3 are receiving dredged material from the deepening. Cell 2 is receiving material dredged by the Pullen. Cell 3 is receiving material dredged by the Charleston. The Pullen and the Charleston are both 24-inch hydraulic cutterhead suction dredges owned and operated by the Norfolk Dredging Company. The environmental monitoring program for cells 2 and 3 includes material flowing into the containment cells (influent), water and associated suspended solids discharging from the cells back to the Delaware River (effluent), water samples collected in the Delaware River in the vicinity of the discharge point (representing some initial mixing), and water samples collected in the Delaware River at a location that can provide background water quality data. Effluent samples were collected with an automatic sampler set to collect aliquots of water at six-hour intervals. Composited samples were retrieved from the automatic sampler every three to four days. Water samples representing background and some initial mixing and samples of the dredged material slurry entering the cells were collected as grab samples. Samples were analyzed in the laboratory for metals, pesticides, polychlorinated biphenyls (PCBs) and semi-volatile organics.

Sample results were compared to Delaware River Basin Commission (DRBC) and Delaware DNREC freshwater water quality criteria for protection of aquatic life. Acute criteria were considered to assess short duration, higher concentration exposures in the Delaware River near the discharge points ("near-field" assessment). Chronic criteria were considered to assess longer term, lower concentration exposures after complete mixing over a broader area of the Delaware River ("far-field" assessment).

Total aluminum concentrations exceeded the DRBC and DNREC chronic criterion, and in most samples acute criterion, in all background, weir discharge and Delaware River mix samples. Because aluminum criteria were exceeded in all background samples, results for the weir discharge and mix samples are not attributed to the dredged material disposal operation. Excluding aluminum, only two metals exceeded acute criteria during the monitoring period in isolated incidences. Dissolved zinc exceeded the acute criterion in a cell 2 weir discharge sample collected on March 18, 2010. Dissolved chromium exceeded the acute criterion for chromium VI in a cell 2 mix sample collected on March 22, 2010. The remaining 39 samples

collected at the weirs and at locations representing some initial mixing for cells 2 and 3 were all below acute criteria for zinc and chromium VI. The chromium VI exceedance is a worst case evaluation because the laboratory analyzed for total chromium and it is not known if chromium VI was actually present in the sample. The acute criterion for the less toxic chromium III is much higher than the concentration of chromium detected in the March 22, 2010 sample. No pesticides or PCBs were detected at concentrations above acute criteria. Overall acute water quality criteria were not exceeded and it is concluded that operation of cells 2 and 3 of the Killcohook dredged material containment facility is not impacting water quality in the immediate vicinity of the discharge.

There were infrequent detections of a few metals and pesticides at concentrations slightly above chronic criteria. Mercury did frequently exceed the lowest DRBC chronic criterion of 12 parts per trillion (ppt). However, mercury only exceeded the DNREC chronic criterion of 77 ppt in one sample, and did not exceed the U.S. Environmental Protection Agency recommended chronic criterion of 770 ppt. Mercury also exceeded the lowest chronic criterion in background. Considering that exceedances of chronic criteria were infrequent and at concentrations slightly above criteria along with the amount of mixing that takes place in this portion of the Delaware River, it is concluded that "far-field" water quality objectives established by the lower chronic criteria are being met in the Delaware River during this period of discharge from the Killcohook facility.

A mass balance evaluation of the contaminant load entering and leaving cell 2 of the Killcohook facility indicates that for most contaminants detected in the material entering the site, greater than 99 percent of the contaminant load was retained in cell 2 and not released back to the Delaware River. The lowest retention efficiency was 94.7 percent for the pesticide dieldrin. Previous mass balance analyses for containment facilities in the vicinity of Marcus Hook, PA have demonstrated similar results. This may be perceived by some to be a benefit to the aquatic environment. Delaware River dredged material has been used for a variety of beneficial uses. Past testing of dried dredged material has shown that concentrations of contaminants retained in the sites are not high enough to require any special consideration for how the material is used.

Water quality has also been monitored at the point of active dredging. Sampling occurs at a distance of 200 feet directly down-current of the working cutterhead so as to capture any plume generated by the cutterhead. Monitoring includes the collection of detailed data on total suspended sediments (TSS) and turbidity in the dredge plume. A TSS performance standard of 250 mg/L at a distance of 200 feet down-current of the cutterhead has been established through modeling calculations as a TSS level at which water quality criteria would be met. Water samples have also been collected within the dredge plume and at background locations in the Delaware River for contaminant testing.

Correlation of turbidity data collected with a monitoring probe in the field with water samples collected at the same time in the field and later analyzed for TSS in the laboratory established that a probe reading of 168 NTUs equates to a TSS concentration of 250 mg/L. Over 16,000 turbidity measurements have been collected at 0.5, 6 and 11 meter depth increments during active dredging. The data indicate similar results for background and at the point of

dredging. Eighteen percent of the background turbidity measurements were higher than 168 NTUs (primarily recorded from lower depths), while 12 percent of the 11-m and 4 percent of the 6-m turbidity values were over this benchmark. Essentially no values over 168 NTUs were observed at the surface.

Two sets of water samples have also been collected at 6 meter and 11 meter depths at the point of active dredging and at a Delaware River background location and analyzed in the laboratory for metals, pesticides, PCBs and semi-volatile organics. As was the case with Killcohook samples, all background and point of dredging samples exceeded the DRBC and DNREC acute criterion for total aluminum. No other acute criteria were exceeded. Chronic criteria were slightly exceeded for both 11 meter samples for the pesticide 4,4-DDE and one 11 meter sample for the pesticide 4,4-DDD. No other chronic criteria were exceeded at the 6 and 11 meter depths at the point of dredging. Two 11 meter and one 6 meter background samples slightly exceeded the chronic criterion for 4,4-DDE, at concentrations similar to those detected at the dredge. The lack of exceedances of both acute and chronic water quality criteria at the point of dredging, and data demonstrating that TSS levels down-current of the cutterhead are similar to background indicate that water quality is not being impacted at the dredge.

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1.0 INTRODUCTION

This is an interim report of the on-going environmental monitoring associated with the first construction contract for the Delaware River Main Stem Channel Deepening Project. The project calls for deepening the existing Delaware River Federal Navigation Channel from 40 to 45 feet from Philadelphia Harbor, Pa., and Beckett Street Terminal, Camden, N.J., to the mouth of the Delaware Bay, appropriate bend widening, and partial deepening of the Marcus Hook anchorage and relocation of and addition of aids to navigation. Dredged material is to be placed by hydraulic and hopper dredges in confined upland containment areas in the Delaware River portion of the project and for beneficial uses in Delaware Bay.

On March 1, 2010 the dredge Pullen, which is owned and operated by Norfolk Dredging Company, began dredging for the deepening project in Reach C of the Delaware River Federal navigation channel (Figure 1-1). Dredging for deepening in Reach C extends from channel station 182+000 (vicinity of the Delaware Memorial Bridge) to channel station 242+514.5 (vicinity of Elsinboro Point, NJ). The Pullen is a 24-inch hydraulic cutterhead suction dredge. The Pullen began dredging in the navigation channel at station 231+000 (vicinity of Salem River, NJ). Dredged material is being pumped via pipeline from the Pullen to cell 2 of the Federally owned Killcohook confined upland dredged material containment facility (Figure 1-1).

On April 18, 2010 a second Norfolk Dredging Company dredge, the Charleston, also began dredging in Reach C of the navigation channel for the deepening project. The Charleston is also a 24-inch hydraulic cutterhead suction dredge. The Charleston began dredging in the navigation channel at station 216+000 (vicinity of the Killcohook dredged material containment facility). Dredged material is being pumped via pipeline from the Charleston to cell 3 of the Federally owned Killcohook confined upland dredged material containment facility (Figure 1-1).

Two types of environmental monitoring are being conducted during Reach C construction for the deepening project. Water quality is being monitored at cells 2 and 3 of the Killcohook dredged material confined disposal facility (CDF). Sampling includes material flowing into the containment cells (influent), water and associated suspended solids discharging from the cells back to the Delaware River (effluent), water samples collected in the Delaware River in the vicinity of the discharge point (representing some initial mixing), and water samples collected in the Delaware River at a location that can provide background water quality data.

In addition to monitoring at the Killcohook facility, periodic water quality monitoring is also taking place at the working dredge at a distance of 200 feet directly down-current so as to capture any plume generated by the dredge. Monitoring includes the collection of detailed data on total suspended sediments (TSS) and turbidity in the dredge plume. A TSS performance standard of 250 mg/L at a distance of 200 feet down-current of the cutterhead has been established through modeling calculations as a TSS level at which water quality criteria would be met. Water samples have also been collected within the dredge plume and at background locations in the Delaware River for contaminant testing.

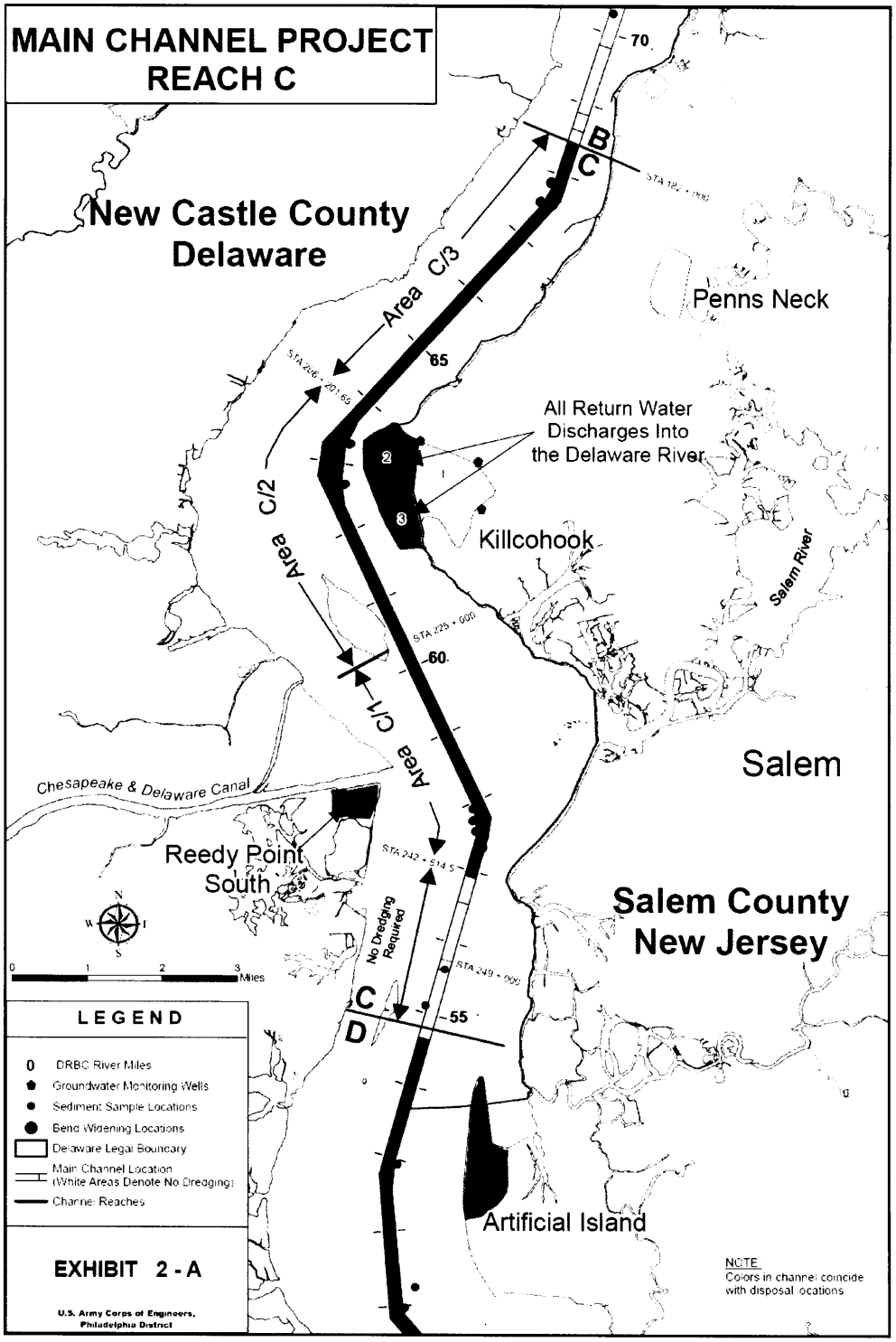


Figure 1-1. Main channel Reach C dredging area and the location of Killcohook Cells 2 and 3

2.0 CONFINED DISPOSAL FACILITY MONITORING

2.1 CDF MONITORING FIELD METHODS

The weir discharges were sampled using ISCO® automatic samplers to obtain composite samples throughout the discharge period as well as daily TSS samples. The sampler consists of a peristaltic pump, controlled by a computer, which allows for collecting fixed amounts of water into sample containers over a period of time. The samples were collected through Teflon tubing that was suspended into the weir at the mouth of the outfall pipe. The sample routine for this project was designed to collect water at 6-hour intervals. Sample jars for inorganics, pesticides, PCBs, and TSS were filled over the course of 3-4 days. Daily samples of TSS were analyzed and the remaining parameters were composited for the 3-4 day time series. Semi-volatile organic samples and low resolution mercury samples at the weir were not collected in this manner, since the samples must be sealed immediately following collection. A grab sample was collected when the field crew arrived at the site, by manually starting the sampler pump.

Mix samples were collected at the point of discharge where the weir water initially mixes with river water. A grab sample was taken using a swing-arm sampler with individual sample containers fixed onto one end.

Background samples were collected following the methods established for collection of the discharge plume area sample. The background sample location, north of Killcohook at Pennsville, New Jersey was determined to be similar to the discharge plume site in physical regime and free from direct chemical influence from any known source of pollutants.

Given the high-pressure flow out of the influent pipe, a grab sample was taken using a swing-arm sampler with individual sample containers fixed onto one end. The sample container was lowered into the influent flow, at the point where the dredged material was falling into the accumulated dredged material in the CDF. This is an area of rapid mixing, which allowed for sampling the influent as close to the hydraulic pipeline discharge point as possible.

2.2 CONTAMINANT RESULTS

Contaminant data have been evaluated from water samples collected at the weirs of cells 2 and 3 (the points where water is discharged from the dredged material containment cells back to the Delaware River), at locations in the Delaware River near the discharge points that represent some initial mixing of the discharge water with Delaware River water, and at a background location in Pennsville, New Jersey outside the influence of the dredging or dredged material disposal operations or other known sources of contamination. These data are presented in Tables 2-1 through 2-21. Where applicable, the data are compared to Delaware River Basin

Commission (DRBC, 2008 section 3.30.2 C.14.b Table 5[1]) and State of Delaware (DNREC, 2004 section 4.6.3.3.1.2 Table 2-1[2]) freshwater acute and chronic criteria for the protection of aquatic life. Freshwater criteria are used because at the time of discharge the salinity of Delaware River water in the vicinity of the Killcohook facility was less than five parts per thousand. If the salinity was greater than five parts per thousand, marine criteria would apply. Salinity measurements collected with a YSI water quality monitoring probe from March 15 through March 17, 2010 showed salinity in the vicinity of Killcohook to be less than 1.5 parts per thousand. Salinity measurements collected on May 20, 2010 showed salinity in the vicinity of Killcohook to be less than 4 parts per thousand, with many readings between 1 and 2 parts per thousand. The tables highlight exceedances of the lower DRBC or DNREC acute criteria in yellow and exceedances of the lower DRBC or DNREC chronic criteria in green. The lowest concentrations used in the comparison are highlighted in the criteria column. According to Greene (2010[3]), acute criteria are used to assess short duration, higher concentration exposures near sources ("near-field" assessment) while chronic criteria are used to assess longer term, lower concentration exposures after complete mixing over broader areas ("far-field" assessment).

2.2.1 Metals

Metals data for Killcohook cells 2 and 3 weir, mix and background samples are presented in Tables 2-1 through 2-10 for both the dissolved and total forms. Delaware River Basin Commission Water Quality Regulations (DRBC, 2008[1]) section 3.10.3 C.2 indicate that stream water quality objectives for cadmium, chromium, copper, lead, nickel, silver and zinc are expressed as the dissolved form of the metal. Stream water quality objectives for aluminum, arsenic, mercury, selenium and cyanide are compared to the total form of the metal. In addition, both DRBC and DNREC criteria for cadmium, chromium III, copper, nickel, silver and zinc are calculated based on water hardness. DNREC also calculates criteria for lead based on water hardness. To calculate these criteria, a conservative water hardness of 75 mg/L was assumed. Weir discharges were consistently measured for low resolution mercury but due to changes in the work scope as the project progressed mix and background collections were not consitently sampled for low level mercury, particularly in earlier sample dates.

Tables 2-1 and 2-2 present background dissolved metal data and background total metal data measured approximately 4.5 miles up-river of Killcohook at Riverview Beach Park in Pennsville, New Jersey. The lowest of the DRBC and DNREC acute and chronic criteria were

[1] **Delaware River Basin Commission. 2008**. Administrative Manual - Part III Water Quality Regulations with Amendments Through July 16, 2008. 18 CFR Part 410.

[2] **Delaware Department of Natural Resources and Environmental Control. 2004**. State of Delaware Surface Water Quality Standards as Amended, July 11, 2004.

[3] **Greene, R. 2010**. An Evaluation of Toxic Contaminants in the Sediments of the Tidal Delaware River and Potential Impacts Resulting from Deepening the Main Navigation Channel in Reach C. Delaware Department of Natural Resources and Environmental Control, Division of Water Resources Watershed Assessment Branch, Dover, DE. Final of June 7, 2010.

met for all metals except aluminum and mercury (Table 2-2). Total aluminum concentrations exceeded the DRBC and DNREC freshwater chronic criterion of 87 µg/L (parts per billion) in all seven samples. Total aluminum concentrations exceeded the DRBC and DNREC freshwater acute criterion of 750 µg/L in five of the seven samples. One of the seven background water samples collected on May 4, 2010 had a total mercury concentration of 16.8 ng/L (parts per trillion). This exceeded the DRBC chronic criterion of 12 ng/L but not the DNREC chronic criterion of 77 ng/L.

Tables 2-3 through 2-6 present dissolved and total metal data for the weir discharge points of cells 2 and 3. Similar to background, total aluminum concentrations exceeded the DRBC and DNREC freshwater chronic criterion of 87 µg/L in all 15 cell 2 samples (Table 2-4) and all six cell 3 samples (Table 2-6). Also, total aluminum concentrations exceeded the DRBC and DNREC freshwater acute criterion of 750 µg/L in 14 of 15 cell 2 samples (Table 2-4) and five of six cell 3 samples (Table 2-6). Other than aluminum, the only exceedance of an acute criterion in water samples collected at the discharge points of cells 2 and 3 was one sample collected at cell 2 on March 18, 2010. This sample had a zinc concentration of 155 ug/L, which is above both DRBC and DNREC acute criteria for zinc. All other water samples collected at the discharge points of cells 2 and 3 had zinc concentrations well below acute and chronic criteria.

Weir data for cell 3 indicate that there were no exceedances of DRBC or DNREC freshwater chronic criteria for any metal except aluminum (Tables 2-5 and 2-6). For cell 2, there were no exceedances of chronic criteria for arsenic, copper, nickel, selenium, silver and cyanide (Tables 2-3 and 2-4). There were chronic exceedences at cell 2 for mercury, cadmium, chromium and lead. Total mercury concentrations exceeded the DRBC chronic criterion of 12 ng/L in 10 of the 15 samples (Table 2-4). None of the total mercury concentrations exceeded the DNREC chronic criterion of 77 ng/L. Dissolved cadmium concentrations in three samples (1.5, 0.25 and 0.23 µg/L) exceeded the DNREC freshwater chronic criterion of 0.20 µg/L and one sample exceeded the DRBC chronic criterion of 0.90 µg/L (Table 2-3). Two of the 15 samples (14.1 and 13.5 µg/L) exceeded the DRBC and DNREC dissolved chromium chronic criterion of 11 µg/L (Table 2-3). Finally, one of the 15 samples (1.9 µg/L) slightly exceeded the DNREC dissolved lead chronic criterion of 1.84 µg/L but not the DRBC criterion of 16 µg /L (Table 2-3).

Tables 2-7 through 2-10 present dissolved and total metal data for the mix samples collected for cells 2 and 3. The mix samples were collected at locations in the Delaware River near the discharge points that represent some initial mixing of the discharge water with Delaware River water. Again similar to background, total aluminum concentrations exceeded DRBC and DNREC freshwater chronic and acute criteria in all 13 cell 2 samples (Table 2-8) and all six cell 3 samples (Table 2-10). Other than aluminum, the only exceedance of an acute criterion in water samples collected at the mix locations for cells 2 and 3 was one sample collected at cell 2 on March 22, 2010. This sample had a chromium concentration of 21.4 ug/L, which is above both DRBC and DNREC acute criteria for chromium.

Mix data for cell 3 is presented in Tables 2-9 and 2-10. Other than aluminum, there were no exceedances of DRBC or DNREC freshwater chronic criteria for any metal except mercury and cyanide. Total mercury concentrations exceeded the DRBC chronic criterion of 12 ng/L in

three of the four samples (Table 2-10). None of the total mercury concentrations exceeded the DNREC chronic criterion of 77 ng/L. One of seven samples (11.4 µg/L) exceeded the DNREC and DRBC chronic criterion for cyanide, which is 5.2 µg/L (Table 2-10). For cell 2 mix samples, there were no exceedances of chronic criteria for arsenic, cadmium, nickel, selenium, silver, zinc and cyanide (Tables 2-7 and 2-8). Total mercury concentrations exceeded the DRBC chronic criterion of 12 ng/L in five of the 13 samples (Table 2-8). Only one of the total mercury concentrations exceeded the DNREC chronic criterion of 77 ng/L, which was 216 ng/L on May 6, 2010. Four of the 13 samples (21.4, 11.4, 15.2 and 12.8 µg/L) exceeded the DRBC and DNREC dissolved chromium chronic criterion of 11 µg/L (Table 2-7). Two of the 13 samples (2.8 and 4.6 µg/L) exceeded the DNREC dissolved lead chronic criterion of 1.84 µg/L but not the DRBC criterion of 16 µg/L (Table 2-7). One sample (9.9 µg/L) exceeded the DNREC and DRBC chronic criteria for copper, which are 7.0 and 9.25, respectively.

Total aluminum exceeded the DNREC and DRBC chronic criterion of 87 µg/L in all background, weir discharge and Delaware River mix samples. Total aluminum exceeded the DNREC and DRBC acute criterion of 750 µg/L in 44 of the 47 samples. Because aluminum criteria were exceeded in all background samples, aluminum exceedances in weir discharge and Delaware River mix samples are not considered to be the result of the dredged material disposal operation.

With regard to water quality impacts in close proximity to discharges of water from cells 2 and 3 of the Killcohook dredged material containment facility ("near-field" impacts), only one weir discharge sample had a zinc concentration above acute criteria and one mix sample had a chromium concentration above the acute criterion. The lack of exceedances of acute criteria indicate that the dredged material disposal operations are not impacting water quality close to the discharges.

With regard to "far-field" water quality impacts (exceedances of chronic criteria over a broader area after complete mixing), arsenic, nickel, selenium and silver did not exceed DRBC or DNREC freshwater chronic criteria for the protection of aquatic life in any water samples. Zinc, copper and cyanide exceeded criteria in one sample each. Zinc had a concentration of 155 µg/L in the cell 2 weir discharge sample collected on March 18, 2010. This concentration was above both DRBC and DNREC chronic criteria. No other sample has exceeded zinc chronic criteria. One Delaware River mix sample (cell 2 mix collected on March 22, 2010) had a dissolved copper concentration of 9.9 µg/L. That concentration is slightly above DRBC and DNREC chronic criteria, which are 9.25 and 7.00, respectively. No other sample has exceeded copper acute or chronic criteria. The copper criteria were calculated with a conservative hardness value of 75 mg/L but if a hardness of 115 or greater had been used, both criteria would be above 9.9 µg/L. One Delaware River mix sample (cell 3 mix collected on April 27, 2010) had a dissolved cyanide concentration of 11.4 µg/L. That concentration is above the DRBC and DNREC chronic criterion for cyanide, which is 5.2 µg/L. No other sample has exceeded the chronic criterion for cyanide. These one-time sample exceedances of zinc, copper and cyanide are not considered significant relative to these elements impacting Delaware River water quality. Lead exceeded the DNREC chronic criterion of 1.84 µg/L but not the DRBC chronic criterion of 16 µg/L in three samples. The April 2, 2010 cell 2 weir discharge sample had a lead

concentration of 1.9 µg/L. The April 6, 2010 and April 8, 2010 cell 2 Delaware River mix samples had lead concentrations of 2.8 and 4.6 µg/L, respectively. As it is with copper, the DNREC chronic criteria were calculated with a hardness value of 75 mg/L. Back calculating these hardness based criteria indicated that if a hardness of 115 had been used, the lead concentrations of 1.9 and 2.8 µg/L would be below the DNREC chronic criterion. Cell 2 weir discharge samples for March 22 and 24, 2010 had cadmium concentrations above the DNREC chronic criterion of 0.20 µg/L but not above the DRBC chronic criterion of 0.90 µg/L. These water samples had cadmium concentrations of 0.25 and 0.23 µg/L, respectively. The cell 2 weir discharge sample for March 18, 2010 had a cadmium concentration of 1.5 µg/L, which is above both the DNREC and DRBC chronic criterion. Again, the cadmium criteria were calculated with a hardness of 75 mg/L. If a hardness of 115 had been used, the March 22 and 24 concentrations of cadmium would fall below the DNREC chronic criterion. In any event, the copper exceedance, two of the lead exceedances and two of the cadmium exceedances were very close to the chronic criteria assuming a conservative hardness of 75 mg/L. These few and minor exceedances of chronic criteria would not have an impact on Delaware River water quality from a "far-field" perspective considering the amount of mixing that occurs at this location.

Chromium exceeded the chronic criterion of 11 µg/L in the March 22, 2010 and April 19, 2010 cell 2 weir discharge samples. Chromium concentrations were 14.1 and 13.5 µg/L, respectively. Chromium also exceeded the chronic criterion in the March 22, 2010, March 29, 2010, April 18, 2010 and April 19, 2010 cell 2 Delaware River mix samples. Chromium concentrations were 21.4, 11.4, 15.2 and 12.8 µg/L, respectively. Different water quality criteria for the protection of aquatic life have been established for chromium III and the more toxic chromium VI. For this monitoring effort, only total chromium was measured. Therefore it is not possible to tell the percentages of chromium III and chromium VI in the samples. The lowest chronic criterion for chromium III is 58.56 µg/L, which is well above the measured concentrations of total chromium in all samples. The lower chronic criterion for chromium VI (11 µg/L) was used as a worst case analysis assuming that 100 percent of measured chromium was chromium VI. If it was assumed that only 70 percent of the chromium in the samples was chromium VI then five of the six samples above the chronic criterion would fall below the criterion. It is likely that if the percentages of chromium III and chromium VI were known then some of the exceedances noted in the tables would be removed.

A number of weir discharge and Delaware River mix samples did exceed the lower DRBC mercury chronic criterion of 12 parts per trillion, but only one sample exceeded the DNREC chronic criterion of 77 parts per trillion. For protection of aquatic life, the U.S. Environmental Protection Agency recommends 770 ng/L as the mercury freshwater chronic criterion (http://www.epa.gov /waterscience/criteria/wqctable/). The highest concentration of mercury detected was 216 ng/L. This is less than a third of the USEPA chronic criterion. Considering the amount of mixing that occurs between weir discharge water and Delaware River water at this location, even the lower DRBC chronic mercury objective will be achieved.

Overall, the metals data presented in this interim monitoring report suggest that operation of cells 2 and 3 of the Killcohook dredged material containment facility is not impacting Delaware River water quality. Arsenic, copper, nickel, selenium, silver, zinc and cyanide did not

exceed criteria or only exceeded in one sample. Cadmium and lead each had three exceedances of their respective chronic criteria, but some of the exceedances were very close to the chronic criteria and if the criteria had been calculated with a slightly higher hardness value some of the exceedances would not have occurred. The chromium analysis was worst case assuming 100 percent of the chromium in samples was the more toxic chromium VI rather than chromium III. If the percentages of chromium III and chromium VI were known, it is likely that some of the exceedances would not have occurred. While there were a number of exceedances of mercury above the lowest DRBC chronic criterion (12 parts per trillion) there was only one exceedance of mercury above the DNREC chronic criterion (77 parts per trillion). Considering that; 1) acute criteria were only exceeded in two samples (a cell 2 weir discharge sample for zinc and a cell 2 Delaware River mix sample for chromium, which is suspect as discussed above), 2) that infrequent chronic exceedances occurred (except for mercury) at concentrations slightly above the lowest chronic criterion, and 3) the volume of Delaware River water that completely mixes with the weir discharge water at this location, it is concluded that operation of cells 2 and 3 of the Killcohook dredged material containment facility is not impacting Delaware River water quality relative to metals from both "near-field and "far-field" perspectives.

Table 2-1. Killcohook Background Dissolved Metal Data.

Sample ID Lab Report ID		BG03188 C0C190563002	BG0324 C0C250605001	BG0402 C0D060501002	BG0406 C0D070526002	BG0504 C0E060542002	BG0511 C0E120504002	BG0517 C0E180492002	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		3/18/2010	3/24/2010	4/2/2010	4/6/2010	5/4/2010	5/11/2010	5/17/2010				
Analyte	**Unit**											
Aluminum-Diss	µg/L	10.3	29	7.2	158	4.4	5.2	9.8				
Antimony-Diss	µg/L	0.76	0.14	0.32	0.46	0.31	0.46	0.47				
Arsenic-Diss	µg/L	4.7	0.9	0.6	0.33	2.4	1.7	3.8				
Barium-Diss	µg/L	20.8	12.8	18	21.3	13.4	17.5	22.8				
Beryllium-Diss	µg/L	ND	ND	ND	ND	ND	ND	ND				
Cadmium-Diss	µg/L	ND	ND	ND	ND	ND	ND	ND	1.52	**0.20**	2.84	0.90
Calcium-Diss	µg/L	15500	12500	12200	13600	20900	20100	26600				
Chromium-Diss	µg/L	3.4	4.3	5.7	6.2	4.1	3.5	4.9	16	**11**	16	11
Cobalt-Diss	µg/L	0.033	0.081	0.05	0.15	0.081	0.085	0.081				
Copper-Diss	µg/L	2	2.4	1.3	2	1.1	1.3	1.5	10.25	**7.00**	13.52	9.25
Iron-Diss	µg/L	16.5	108	30.5	237	7.8	10.3	34.6				
Lead-Diss	µg/L	0.23	0.23	0.59	0.58	ND	ND	0.035	47.15	**1.84**	48	16
Magnesium-Diss	µg/L	5900	4070	3540	4350	10900	8370	33400				
Manganese-Diss	µg/L	11.1	7.8	13.7	14	0.41	0.6	3.1				
Nickel-Diss	µg/L	0.58	1.1	2.6	1.2	0.76	0.91	0.86	367.08	**40.77**	1111.87	123.61
Potassium-Diss	µg/L	2020	1800	1600	1940	3380	2700	10400				
Selenium-Diss	µg/L	0.7	0.43	1.5	ND	0.57	ND	1.1				
Silver-Diss	µg/L	ND	ND	ND	ND	ND	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	25800	18500	14200	16900	56800	35400	255000				
Thallium-Diss	µg/L	0.036	0.091	0.023	0.059	0.021	0.22	0.28				
Vanadium-Diss	µg/L	4.5	ND	0.88	ND	0.15	0.98	2.5				
Zinc-Diss	µg/L	7.2	7.6	9.7	14.6	5.2	4.3	8.6	91.83	92.58	91.71	**83.06**

Table 2-2. Killcohook Background Total Metal Data.

Sample ID Lab Report ID		BG0318 C0C190563002	BG0324 C0C250605001	BG0402 C0D060501002	BG0406 C0D070526002	BG0504 C0E060542002	BG0511 C0E120504002	BG0517 C0E180492002	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		3/18/2010	3/24/2010	4/2/2010	4/6/2010	5/4/2010	5/11/2010	5/17/2010				
Analyte:	**Unit**											
Aluminum	µg/L	**967**	**7610**	**920**	**921**	**2780**	**1140**	**972**	750	**87**	750	87
Antimony	µg/L	0.28	0.36	0.39	0.27	0.54	0.6	0.51				
Arsenic	µg/L	8.9	4.6	1.1	ND	2.7	3.3	2.3	340	**150**	360	190
Barium	µg/L	26.7	70	21.5	27	32	29	26				
Beryllium	µg/L	0.096	0.36	0.071	0.064	0.17	0.06	0.037				
Cadmium	µg/L	ND	0.15	ND	ND	ND	ND	ND				
Calcium	µg/L	15100	14000	12000	13600	19700	21000	25400				
Chromium	µg/L	9.4	23.5	6.1	8.6	9.8	7.4	5.3				
Cobalt	µg/L	0.45	4.8	0.37	0.54	1.8	0.96	0.43				
Copper	µg/L	3	13.7	2.7	3.2	5.2	4	2.2				
Iron	µg/L	1240	11900	919	1330	4160	1760	903				
Lead	µg/L	2.2	19.9	1.6	2.3	6.2	3	1.4				
Magnesium	µg/L	5840	6040	3580	4480	10800	8780	31500				
Manganese	µg/L	60.5	509	47.1	50.5	183	123	39.2				
Mercury	**ng/L**	Not sampled	Not sampled	2.7	5.2	**16.8**	5.7	1.8	1400	77	2400	**12**
Nickel	µg/L	1.3	10.9	1.1	2.1	4.1	2.8	1.6				
Potassium	µg/L	2140	3480	1930	1970	4010	3360	9970				
Selenium	µg/L	0.71	ND	0.86	ND	ND	0.66	1.1	20	**5.0**	20	5.0
Silver	µg/L	ND	0.1	ND	ND	0.04	ND	ND				
Sodium	µg/L	24700	18800	13900	16200	52500	35300	241000				
Thallium	µg/L	0.29	0.21	ND	0.14	0.069	0.22	0.16				
Vanadium	µg/L	14.8	17.6	1.8	2.2	7.1	4	3.8				
Zinc	µg/L	12.1	84.4	18.1	15.8	34.3	46.4	20.3				
Cyanide	µg/L	ND	ND	ND	ND	ND	ND	ND	22	5.2	22	**5.2**

Table 2-3. Killcohook Cell 2 Weir Dissolved Metal Data.

Sample ID Lab Report ID		WIER0318 C0C190563007	WIER0322 C0C230507002	WIER0324 C0C250605003	WIER0329 C0C300513003	WIER0402 C0D060501004	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		3/18/2010	3/22/2010	3/24/2010	3/29/2010	4/2/2010				
Analyte	**Unit**									
Aluminum-Diss	µg/L	3.3	52	1240	7	1360				
Antimony-Diss	µg/L	0.54	0.79	0.58	0.84	0.83				
Arsenic-Diss	µg/L	7.4	5.5	4.2	4	3.6				
Barium-Diss	µg/L	80.2	68.5	54.1	28.5	24.7				
Beryllium-Diss	µg/L	ND	ND	0.048	ND	0.076				
Cadmium-Diss	µg/L	**1.5**	**0.25**	**0.23**	ND	ND	1.52	**0.20**	2.84	0.90
Calcium-Diss	µg/L	78100	50800	39400	25000	18600				
Chromium-Diss	µg/L	6.2	**14.1**	7.7	9.6	8.7	16	11	16	11
Cobalt-Diss	µg/L	2.1	1.3	2	0.91	1.1				
Copper-Diss	µg/L	3.5	4.9	4.8	2.3	3.9	10.25	**7.00**	13.52	9.25
Iron-Diss	µg/L	63.9	97.8	1060	69.2	1330				
Lead-Diss	µg/L	0.14	0.11	1.4	0.076	**1.9**	47.15	**1.84**	48	16
Magnesium-Diss	µg/L	162000	101000	68400	41300	31600				
Manganese-Diss	µg/L	3030	1600	2110	1320	797				
Nickel-Diss	µg/L	11.4	5.3	6.6	4.1	3.9	367.08	**40.77**	1111.87	123.61
Potassium-Diss	µg/L	37600	28200	20800	15300	12800				
Selenium-Diss	µg/L	2.7	1.6	2.9	2.1	2.3				
Silver-Diss	µg/L	ND	ND	ND	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	1060000	693000	457000	258000	220000				
Thallium-Diss	µg/L	0.054	0.11	0.069	0.034	ND				
Vanadium-Diss	µg/L	3.8	<5.0	1.6	5.1	1.7				
Zinc-Diss	µg/L	**155**	23.7	42.7	7.6	15.7	91.83	92.58	91.71	**83.06**

Table 2-3. (Continued).

Sample ID Lab Report ID		WIER0406 C0D070526004	WIER0408 C0D090487003	WIER0414 C0D150544003	WIER0419 C0D200485002	WIER0422 C0D230554002	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/6/2010	4/8/2010	4/14/2010	4/19/2010	4/22/2010				
Analyte	**Unit**									
Aluminum-Diss	µg/L	129	1900	36.2	766	1640				
Antimony-Diss	µg/L	0.87	0.77	1.3	0.66	1.2				
Arsenic-Diss	µg/L	2.3	2.9	2.7	3.3	2.8				
Barium-Diss	µg/L	15.8	22.5	12.6	23.9	63.3				
Beryllium-Diss	µg/L	ND	0.12	ND	0.057	0.067				
Cadmium-Diss	µg/L	ND	ND	ND	ND	ND	1.52	0.20	2.84	0.90
Calcium-Diss	µg/L	17900	16600	16200	20200	36300				
Chromium-Diss	µg/L	8.8	10	3.2	13.5	5.8	16	11	16	11
Cobalt-Diss	µg/L	0.63	1.1	0.52	1.1	2				
Copper-Diss	µg/L	3.7	4.8	5	4	3.2	10.25	7.00	13.52	9.25
Iron-Diss	µg/L	132	1640	36.4	816	1530				
Lead-Diss	µg/L	0.26	1.8	0.14	1	1.7	47.15	1.24	48	16
Magnesium-Diss	µg/L	31700	28600	24300	39100	72200				
Manganese-Diss	µg/L	711	599	578	1290	2340				
Nickel-Diss	µg/L	2.7	4	2.6	3.3	3.7	367.08	40.77	1111.87	123.61
Potassium-Diss	µg/L	14100	13100	11000	12700	22000				
Selenium-Diss	µg/L	1.2	0.93	0.86	3.1	2.5				
Silver-Diss	µg/L	ND	ND	ND	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	227000	201000	162000	211000	463000				
Thallium-Diss	µg/L	0.017	0.036	0.07	0.085	0.048				
Vanadium-Diss	µg/L	ND	2.4	2.7	2.5	2.4				
Zinc-Diss	µg/L	12.5	19.1	12.4	8.9	18.8	91.83	92.58	91.71	83.06

Table 2-3. (Continued).

Sample ID Lab Report ID		WIER0427 C0D280512003	WIER0504 C0E060542004	WEIR0506 C0E070494003	WIER0511 C0E120504003	WIER0517 C0E180492004	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/27/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**									
Aluminum-Diss	µg/L	9.5	74.2	58	5.4	ND				
Antimony-Diss	µg/L	0.76	1.7	0.77	0.93	1.1				
Arsenic-Diss	µg/L	3.1	4	5.3	5.1	4.4				
Barium-Diss	µg/L	60.6	45.6	54.2	62	113				
Beryllium-Diss	µg/L	ND	ND	ND	ND	ND				
Cadmium-Diss	µg/L	ND	ND	ND	ND	ND	1.52	**0.20**	2.84	0.90
Calcium-Diss	µg/L	36000	33800	33000	35000	54500				
Chromium-Diss	µg/L	4.4	2.9	3.9	4	4.2	16	**11**	16	11
Cobalt-Diss	µg/L	1.5	1.2	1.3	1.4	5.3				
Copper-Diss	µg/L	2.8	2.4	2	2.1	1.6	10.25	**7.00**	13.52	9.25
Iron-Diss	µg/L	22.5	140	99.8	14.2	33.6				
Lead-Diss	µg/L	0.046	0.14	0.14	ND	ND	47.15	**1.84**	48	16
Magnesium-Diss	µg/L	71600	59700	55800	54200	109000				
Manganese-Diss	µg/L	2030	2210	2180	2340	6510				
Nickel-Diss	µg/L	2.9	2.7	2.6	2.8	3.8	367.08	**40.77**	1111.87	123.61
Potassium-Diss	µg/L	20500	18700	18400	19400	31900				
Selenium-Diss	µg/L	3.1	2.7	2.9	2.3	3.8				
Silver-Diss	µg/L	ND	0.059	ND	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	471000	414000	388000	388000	918000				
Thallium-Diss	µg/L	0.11	ND	0.099	0.13	0.16				
Vanadium-Diss	µg/L	ND	0.33	0.41	1.1	1.5				
Zinc-Diss	µg/L	8.1	4.2	5	4	11.4	91.83	92.58	91.71	**83.06**

Table 2-4. Killcohook Cell 2 Weir Total Metal Data.

Sample ID Lab Report ID		WIER0318 C0C190563007	WIER0322 C0C230507002	WIER0324 C0C250605003	WIER0329 C0C300513003	WIER0402 C0D060501004	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		3/18/2010	3/22/2010	3/24/2010	3/29/2010	4/2/2010				
Analyte	**Unit**									
Aluminum	µg/L	**1440**	**6120**	**6490**	**13000**	**15800**	750	**87**	750	87
Antimony	µg/L	0.3	0.71	0.43	1.1	0.93				
Arsenic	µg/L	12.8	7	7.9	10.2	7.9	340	**150**	360	190
Barium	µg/L	87.4	94.5	83.3	88.8	87.8				
Beryllium	µg/L	0.09	0.3	0.28	0.59	0.72				
Cadmium	µg/L	1.8	0.54	0.46	0.24	0.15				
Calcium	µg/L	77600	50000	40200	25900	20000				
Chromium	µg/L	11.4	22.5	16.1	36.5	38.9				
Cobalt	µg/L	2.7	3.4	3.9	6.4	7				
Copper	µg/L	5.5	8.9	8.1	15.2	15.2				
Iron	µg/L	2520	5110	6560	14100	16400				
Lead	µg/L	2.3	5.8	7.6	19.2	17.6				
Magnesium	µg/L	160000	97600	70100	46300	34800				
Manganese	µg/L	3070	1770	2200	1650	1390				
Mercury	**ng/L**	**12.1**	**13.9**	**17.8**	**48.1**	**39.7**	1400	77	2400	**12**
Nickel	µg/L	13	10	10.9	15.8	15.3				
Potassium	µg/L	37400	28300	22300	17900	15200				
Selenium	µg/L	1.8	1.5	3.2	2.4	1.9	20	**5.0**	20	5.0
Silver	µg/L	0.062	0.092	0.075	0.12	0.11				
Sodium	µg/L	1040000	654000	456000	276000	222000				
Thallium	µg/L	0.13	0.14	0.14	0.34	0.064				
Vanadium	µg/L	13.1	ND	10.6	34.1	28.9				
Zinc	µg/L	196	87.3	88.9	99.8	108				
Cyanide	µg/L	ND	ND	ND	ND	ND	22	5.2	22	**5.2**

Table 2-4. (Continued).

Sample ID Lab Report ID		WIER0406 C0D070526004	WIER0408 C0D090487003	WIER0414 C0D150544003	WIER0419 C0D200485002	WIER0422 C0D230554002	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/6/2010	4/8/2010	4/14/2010	4/19/2010	4/22/2010				
Analyte	**Unit**									
Aluminum	µg/L	**17400**	**15100**	**9590**	**6450**	**7190**	750	**87**	750	87
Antimony	µg/L	0.93	0.84	0.85	0.68	0.79				
Arsenic	µg/L	7.1	7.3	6	5.7	8.4	340	**150**	360	190
Barium	µg/L	91.7	78.4	57.5	53.5	95.4				
Beryllium	µg/L	0.76	0.74	0.45	0.26	0.29				
Cadmium	µg/L	0.2	<1.0	0.18	<1.0	<1.0				
Calcium	µg/L	18600	17600	17200	25200	37700				
Chromium	µg/L	42.2	39	24	14.9	15.7				
Cobalt	µg/L	7.3	5.6	3.6	2.7	4.1				
Copper	µg/L	16.2	15.5	12.2	9	7.1				
Iron	µg/L	16800	14300	8940	5570	7630				
Lead	µg/L	18.5	15.4	9.9	5.8	8.5				
Magnesium	µg/L	33400	31300	25900	44500	74700				
Manganese	µg/L	1260	960	879	1570	2590				
Mercury	**ng/L**	**33.4**	**27.3**	**19.3**	7.6	**24.9**	1400	77	2400	**12**
Nickel	µg/L	16.9	14.5	9.7	6.9	7.8				
Potassium	µg/L	16800	15700	13200	15900	23400				
Selenium	µg/L	1.2	<5.0	1	1.9	3	20	**5.0**	20	5.0
Silver	µg/L	0.1	0.07	0.04	0.099	<1.0				
Sodium	µg/L	213000	201000	163000	263000	471000				
Thallium	µg/L	0.21	0.15	0.25	0.077	0.22				
Vanadium	µg/L	28.5	24.9	19.7	13.4	12				
Zinc	µg/L	115	89.5	51.6	34.6	45				
Cyanide	µg/L	<10.0	<10.0	<10.0	<10.0	<10.0	22	5.2	22	**5.2**

Table 2-4. (Continued).

Sample ID Lab Report ID		WIER0427 C0D280512003	WIER0504 C0E060542004	WEIR0506 C0E070494003	WIER0511 C0E120504003	WIER0517 C0E180492004	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/27/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**									
Aluminum	µg/L	**2930**	**1770**	**2020**	**2480**	**376**	750	**87**	750	87
Antimony	µg/L	0.68	1.6	0.72	1	1				
Arsenic	µg/L	6.3	5.1	6.9	7.7	5.6	340	**150**	360	190
Barium	µg/L	79.5	56.8	68.8	83.5	121				
Beryllium	µg/L	0.085	0.082	0.12	0.095	ND				
Cadmium	µg/L	ND	ND	ND	ND	ND				
Calcium	µg/L	37000	33900	34000	34800	54200				
Chromium	µg/L	8.3	6.7	7.4	10.2	5				
Cobalt	µg/L	2.4	2	2.2	2.6	6.1				
Copper	µg/L	4.6	4.2	3.8	4.6	2.5				
Iron	µg/L	3140	2430	2570	3060	1870				
Lead	µg/L	3.1	2.3	2.9	4	1.3				
Magnesium	µg/L	72900	58300	57300	54300	106000				
Manganese	µg/L	2280	2290	2320	2300	6850				
Mercury	**ng/L**	3	4.9	**23.6**	2.6	5.8	1400	77	2400	**12**
Nickel	µg/L	4.7	4.5	4.4	5.2	4.2				
Potassium	µg/L	21400	19200	18900	20200	31600				
Selenium	µg/L	3	2.6	2.8	2.8	3.8	20	**5.0**	20	5.0
Silver	µg/L	0.046	ND	ND	ND	ND				
Sodium	µg/L	475000	401000	392000	389000	908000				
Thallium	µg/L	0.035	0.025	0.097	0.13	0.096				
Vanadium	µg/L	3.5	3.5	3.7	5	ND				
Zinc	µg/L	23	23.8	15.7	48.2	34.2				
Cyanide	µg/L	ND	ND	ND	2.9	3.4	22	5.2	22	**5.2**

Table 2-5. Killcohook Cell 3 Weir Dissolved Metal Data.

Sample ID Lab Report ID		WIER0427 C0D280518003	WIER0429 C0D300570003	WIER0504 C0E060543003	WIER0506 C0E070562003	WIER0511 C0E120515002	WIER0517 C0E180515003	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/27/2010	4/29/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**										
Aluminum-Diss	µg/L	3.2	ND	3.4	3	3.4	ND				
Antimony-Diss	µg/L	0.54	0.47	0.64	0.61	0.85	0.55				
Arsenic-Diss	µg/L	1.7	2	4.9	3.1	1.9	3.2				
Barium-Diss	µg/L	75.2	39.6	29.8	18.6	20.9	74.3				
Beryllium-Diss	µg/L	ND	ND	ND	ND	ND	ND				
Cadmium-Diss	µg/L	ND	ND	ND	ND	ND	ND	1.52	**0.20**	2.84	0.90
Calcium-Diss	µg/L	23400	30000	28200	22200	25200	43800				
Chromium-Diss	µg/L	4.1	4.2	5.4	4.2	5	4.9	16	**11**	16	11
Cobalt-Diss	µg/L	0.8	1.1	0.7	0.78	0.36	0.88				
Copper-Diss	µg/L	1.2	1.3	1.6	1.2	1.7	1.3	10.25	**7.00**	13.52	9.25
Iron-Diss	µg/L	13.1	10.7	11	8.5	19.4	25.2				
Lead-Diss	µg/L	0.02	ND	ND	ND	0.044	ND	47.15	**1.84**	48	16
Magnesium-Diss	µg/L	41100	52800	38500	24400	27100	84300				
Manganese-Diss	µg/L	653	717	597	574	265	690				
Nickel-Diss	µg/L	2.8	5.4	3	2.7	2.7	2.9	367.08	**40.77**	1111.87	123.61
Potassium-Diss	µg/L	13400	16400	12400	8540	9590	26000				
Selenium-Diss	µg/L	1.6	1.8	1.4	1.1	1.6	3				
Silver-Diss	µg/L	ND	0.085	ND	ND	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	305000	411000	291000	178000	191000	716000				
Thallium-Diss	µg/L	0.031	0.15	ND	0.038	0.026	0.063				
Vanadium-Diss	µg/L	2.8	0.95	2.6	ND	0.5	1.8				
Zinc-Diss	µg/L	16.9	18.9	7.5	5.1	5.8	12.5	91.83	92.58	91.71	**83.06**

Table 2-6. Killcohook Cell 3 Weir Total Metal Data.

Sample ID Lab Report ID		WIER0427 C0D280518003	WIER0429 C0D300570003	WIER0504 C0E060543003	WIER0506 C0E070562003	WIER0511 C0E120515002	WIER0517 C0E180515003	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/27/2010	4/29/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**										
Aluminum	µg/L	**2600**	**1210**	**927**	**1280**	**1100**	**546**	750	**87**	750	87
Antimony	µg/L	0.79	0.91	0.65	0.71	0.97	0.49				
Arsenic	µg/L	2	3.1	3.2	3	3	4.5	340	**150**	360	190
Barium	µg/L	83.3	47.2	32.8	25	25.7	76.6				
Beryllium	µg/L	0.099	0.091	0.049	0.078	0.064	ND				
Cadmium	µg/L	ND	0.14	ND	ND	ND	ND				
Calcium	µg/L	23700	31800	26200	22700	22900	43400				
Chromium	µg/L	7.6	6.7	6	7	7	5.7				
Cobalt	µg/L	1.8	1.8	1.4	1.7	1.3	1.4				
Copper	µg/L	3.6	3.4	3.3	4	3.7	1.6				
Iron	µg/L	1850	1540	1280	1810	1440	1290				
Lead	µg/L	1.8	2	1.4	1.8	2.3	0.88				
Magnesium	µg/L	41700	55700	36100	25000	25500	82200				
Manganese	µg/L	712	781	604	656	502	823				
Mercury	**ng/L**	2.5	3.3	2.6	2.4	1.7	0.52	1400	77	2400	**12**
Nickel	µg/L	5	7.1	4	4.8	4	3.8				
Potassium	µg/L	14000	17400	11900	9010	9700	26000				
Selenium	µg/L	1.7	1.8	1.5	0.9	1.4	2.3	20	**5.0**	20	5.0
Silver	µg/L	ND	0.042	ND	ND	ND	ND				
Sodium	µg/L	307000	424000	272000	179000	184000	706000				
Thallium	µg/L	0.03	0.17	0.025	0.045	0.044	0.036				
Vanadium	µg/L	8.2	5.4	2.4	3.2	4.2	5.3				
Zinc	µg/L	33.9	46.8	20.2	20.1	40.5	23.5				
Cyanide	µg/L	ND	N	ND	ND	ND	ND	22	5.2	22	**5.2**

Table 2-7. Killcohook Cell 2 Mix Dissolved Metal Data.

Sample ID Lab Report ID		MIX0318 C0C190563001	MIX0322 C0C230507001	MIX0324 C0C250605002	MIX0329 C0C300513001	MIX0402 C0D060501001	MIX0406 C0D070526001	MIX0408 C0D090487001	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		3/18/2010	3/22/2010	3/24/2010	3/29/2010	4/2/2010	4/6/2010	4/8/2010				
Analyte	**Unit**											
Aluminum-Diss	µg/L	30.4	7.6	175	248	8.2	2020	3680				
Antimony-Diss	µg/L	0.25	0.98	1.2	0.29	0.32	0.96	0.72				
Arsenic-Diss	µg/L	5	7.5	2.5	2.4	0.86	0.94	2.6				
Barium-Diss	µg/L	32	47.9	51.1	19.4	16	30.4	38.6				
Beryllium-Diss	µg/L	ND	ND	ND	ND	ND	0.12	0.2				
Cadmium-Diss	µg/L	ND	ND	0.27	ND	ND	ND	ND	1.52	**0.20**	2.84	0.90
Calcium-Diss	µg/L	23100	33200	41400	15200	12400	14400	13600				
Chromium-Diss	µg/L	4.9	**21.4**	5.3	**11.4**	4.1	9.6	**15.2**	16	11	16	11
Cobalt-Diss	µg/L	0.3	1.2	1.7	0.28	0.073	0.95	1.7				
Copper-Diss	µg/L	2.2	**9.9**	3.8	2	1.4	4	5.4	10.25	**7.00**	13.52	9.25
Iron-Diss	µg/L	71.4	50.8	199	408	29.8	2040	3940				
Lead-Diss	µg/L	0.25	0.097	0.35	0.8	0.79	**2.8**	**4.6**	47.15	**1.84**	48	16
Magnesium-Diss	µg/L	26300	75400	70900	8090	5020	14200	9210				
Manganese-Diss	µg/L	322	1460	2040	114	32.3	241	224				
Nickel-Diss	µg/L	1.3	5.4	6.1	1.6	2.8	3.3	8.2	367.08	**40.77**	1111.87	123.61
Potassium-Diss	µg/L	6910	23500	21200	2920	2110	6910	4750				
Selenium-Diss	µg/L	0.85	1.1	3.1	ND	1.4	0.47	ND				
Silver-Diss	µg/L	ND	ND	ND	ND	ND	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	158000	518000	470000	40000	24400	89500	41200				
Thallium-Diss	µg/L	0.3	0.25	0.099	0.27	ND	0.17	0.071				
Vanadium-Diss	µg/L	6.9	ND	ND	8.1	ND	1.6	5.9				
Zinc-Diss	µg/L	11.5	18.2	35.3	14.2	9.8	31.1	49.4	91.83	92.58	91.71	**83.06**

Table 2-7. (Continued).

Sample ID Lab Report ID		MIX0419 C0D200485001	MIX0427 C0D280512001	MIX0504 C0E060542001	MIX0506 C0E070494001	MIX0511 C0E120504001	MIX0517 C0E180492001	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/19/2010	4/27/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**										
Aluminum-Diss	µg/L	24.6	21	3.4	280	4.2	221				
Antimony-Diss	µg/L	0.51	0.44	0.61	0.96	0.54	0.76				
Arsenic-Diss	µg/L	ND	1.1	2.9	2.2	1.6	2.6				
Barium-Diss	µg/L	19.2	22.6	20.6	19.8	17.3	31				
Beryllium-Diss	µg/L	ND	ND	ND	ND	ND	ND				
Cadmium-Diss	µg/L	ND	ND	ND	ND	ND	ND	1.52	0.20	2.84	0.90
Calcium-Diss	µg/L	16700	23200	24800	22300	22500	30200				
Chromium-Diss	µg/L	12.8	3.3	3.8	3.7	3.3	4.2	16	11	16	11
Cobalt-Diss	µg/L	0.29	0.33	0.21	0.3	0.22	0.34				
Copper-Diss	µg/L	1.8	1.7	2	1.9	1.4	1.8	10.25	7.00	13.52	9.25
Iron-Diss	µg/L	33	37.4	11.6	502	16.9	323				
Lead-Diss	µg/L	0.09	0.083	ND	0.77	ND	0.55	47.15	1.84	48	16
Magnesium-Diss	µg/L	16400	32500	26800	20000	13000	47400				
Manganese-Diss	µg/L	233	111	143	22.4	151	265				
Nickel-Diss	µg/L	1.7	1.3	1.5	1.6	1.2	1.4	367.08	40.77	1111.87	123.61
Potassium-Diss	µg/L	5030	9230	8530	6370	4230	14600				
Selenium-Diss	µg/L	1.3	1.4	0.96	0.76	0.76	1.4				
Silver-Diss	µg/L	ND	ND	ND	ND	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	84500	224000	177000	129000	71100	368000				
Thallium-Diss	µg/L	0.11	0.13	0.059	0.018	0.16	0.18				
Vanadium-Diss	µg/L	2.7	1.6	ND	0.38	ND	0.95				
Zinc-Diss	µg/L	6.9	7	4.6	6.7	4.7	8.5	91.83	92.58	91.71	83.06

Table 2-8. Killcohook Cell 2 Mix Total Metal Data.

Sample ID Lab Report ID		MIX0318 C0C190563001	MIX0322 C0C230507001	MIX0324 C0C250605002	MIX0329 C0C300513001	MIX0402 C0D060501001	MIX0406 C0D070526001	MIX0408 C0D090487001	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		3/18/2010	3/22/2010	3/24/2010	3/29/2010	4/2/2010	4/6/2010	4/8/2010				
Analyte	**Unit**											
Aluminum	µg/L	**3590**	**12700**	**6760**	**3010**	**3380**	**14000**	**17800**	750	**87**	750	87
Antimony	µg/L	0.38	1.4	0.54	0.52	0.5	1.1	0.66				
Arsenic	µg/L	11.3	10.2	8.4	2.9	1.9	6.6	7	340	**150**	360	190
Barium	µg/L	53.1	108	87.6	40.7	41.5	100	120				
Beryllium	µg/L	0.2	0.6	0.35	0.12	0.19	0.66	0.84				
Cadmium	µg/L	0.24	0.46	0.66	ND	ND	0.31	0.2				
Calcium	µg/L	23600	39500	42400	15400	13200	16300	15400				
Chromium	µg/L	14.3	31.9	19.2	12.8	13.2	37.3	44.3				
Cobalt	µg/L	2	6.5	5.2	1.7	2.1	7.3	8.5				
Copper	µg/L	6.2	16	11	6.2	6.6	19.2	19.4				
Iron	µg/L	4410	12800	9240	4410	5000	17000	20800				
Lead	µg/L	7.8	16.3	12.8	7	7.4	24.9	27.3				
Magnesium	µg/L	27800	76800	73300	8360	5590	18600	12900				
Manganese	µg/L	522	2060	2360	237	238	1000	696				
Mercury	**ng/L**	Not sampled	Not sampled	Not sampled	Not sampled	**20.1**	**68.9**	Not sampled	1400	77	2400	**12**
Nickel	µg/L	4.8	14.3	13.4	4.8	4.6	15.9	19				
Potassium	µg/L	7730	25000	22900	3650	2880	9660	7400				
Selenium	µg/L	0.7	1.5	3.4	ND	0.6	ND	ND	20	**5.0**	20	5.0
Silver	µg/L	0.039	0.16	0.11	ND	0.051	0.14	0.14				
Sodium	µg/L	162000	498000	471000	37200	22800	102000	41300				
Thallium	µg/L	0.26	0.11	0.22	0.24	ND	0.23	0.22				
Vanadium	µg/L	20	ND	10.3	ND	7.3	25.8	28.8				
Zinc	µg/L	54.9	110	122	45.1	45	124	160				
Cyanide	µg/L	ND	ND	ND	ND	ND	ND	ND	22	5.2	22	**5.2**

Table 2-8. (Continued).

Sample ID Lab Report ID		MIX0419 C0D200485001	MIX0427 C0D280512001	MIX0504 C0E060542001	MIX0506 C0E070494001	MIX0511 C0E120504001	MIX0517 C0E180492001	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/19/2010	4/27/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**										
Aluminum	µg/L	**15100**	**10500**	**23800**	**22200**	**2160**	**7780**	750	**87**	750	87
Antimony	µg/L	0.86	0.7	1.1	1.9	0.64	0.65				
Arsenic	µg/L	8	3.5	16.4	16.6	3.3	6.9	340	**150**	360	190
Barium	µg/L	113	73	154	158	34.2	72.5				
Beryllium	µg/L	0.8	0.42	1.2	1.2	0.098	0.39				
Cadmium	µg/L	0.32	0.14	0.72	0.65	ND	ND				
Calcium	µg/L	23900	25100	25400	27400	22400	30400				
Chromium	µg/L	33.3	24	68.9	67.8	9.6	22.4				
Cobalt	µg/L	8.3	5	17.3	17.3	1.6	5.2				
Copper	µg/L	19.1	11.5	37	37.6	4.9	11				
Iron	µg/L	18000	12100	40500	39800	3170	11500				
Lead	µg/L	28	16.8	59.9	61.2	5.3	19.5				
Magnesium	µg/L	26700	36400	24500	29300	14300	48100				
Manganese	µg/L	1300	566	2300	2470	310	1070				
Mercury	**ng/L**	Not sampled	Not sampled	**58.4**	**216**	9.4	**32.1**	1400	77	2400	**12**
Nickel	µg/L	16.4	10.9	33.8	33.1	3.9	10.4				
Potassium	µg/L	9790	11500	9780	11000	5180	15800				
Selenium	µg/L	1.3	1.4	2.1	2.2	1.4	1.6	20	**5.0**	20	5.0
Silver	µg/L	0.23	0.13	0.38	0.41	ND	0.096				
Sodium	µg/L	132000	230000	106000	144000	75800	359000				
Thallium	µg/L	0.21	0.12	0.34	0.27	0.16	0.23				
Vanadium	µg/L	30.1	21.3	60.9	60.3	6.7	20.1				
Zinc	µg/L	124	78.1	251	240	51.9	84.1				
Cyanide	µg/L	ND	ND	ND	ND	ND	1.8	22	5.2	22	**5.2**

Table 2-9. Killcohook Cell 3 Mix Dissolved Metal Data.

Sample ID Lab Report ID		MIX0427 C0D280518001	MIX0429 C0D300570001	MIX0504 C0E060543001	MIX0506 C0E070562001	MIX0511 C0E120515001	MIX0517 C0E180515001	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/27/2010	4/29/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**										
Aluminum-Diss	µg/L	206	161	132	4.5	ND	ND				
Antimony-Diss	µg/L	0.16	0.46	0.45	0.4	1.2	0.39				
Arsenic-Diss	µg/L	0.65	1.7	2.5	2.5	2.3	2.6				
Barium-Diss	µg/L	25.6	16.2	17.1	16.1	23.5	26.5				
Beryllium-Diss	µg/L	ND	ND	ND	ND	ND	ND				
Cadmium-Diss	µg/L	ND	ND	ND	ND	ND	ND	1.52	**0.20**	2.84	0.90
Calcium-Diss	µg/L	26600	19900	23700	21900	36700	28700				
Chromium-Diss	µg/L	4.6	3.3	5	3.5	4.2	4.7	16	**11**	16	11
Cobalt-Diss	µg/L	0.27	0.17	0.19	0.12	0.15	0.1				
Copper-Diss	µg/L	1.9	1.5	1.7	1.3	1.2	1.5	10.25	**7.00**	13.52	9.25
Iron-Diss	µg/L	245	217	208	10.1	22.9	23.5				
Lead-Diss	µg/L	0.38	0.35	0.3	ND	ND	ND	47.15	**1.84**	48	16
Magnesium-Diss	µg/L	47600	18700	21600	19400	59200	42900				
Manganese-Diss	µg/L	35.5	14.4	13.6	24.6	2	11.7				
Nickel-Diss	µg/L	1.2	1.2	1.2	0.87	0.99	1	367.08	**40.77**	1111.87	123.61
Potassium-Diss	µg/L	13400	6000	6750	6200	19100	13400				
Selenium-Diss	µg/L	1.9	0.72	0.8	0.87	2.1	1.8				
Silver-Diss	µg/L	ND	0.53	ND	ND	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	350000	128000	146000	131000	475000	338000				
Thallium-Diss	µg/L	0.048	0.12	0.017	0.057	0.04	0.091				
Vanadium-Diss	µg/L	3.3	0.11	0.65	0.36	0.47	2.6				
Zinc-Diss	µg/L	9.4	4.8	6.5	4.1	4.3	6.6	91.83	92.58	91.71	**83.06**

Table 2-10. Killcohook Cell 3 Mix Total Metal Data.

Sample ID Lab Report ID		MIX0427 C0D280518001	MIX0429 C0D300570001	MIX0504 C0E060543001	MIX0506 C0E070562001	MIX0511 C0E120515001	MIX0517 C0E180515001	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/27/2010	4/29/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**										
Aluminum	µg/L	**3120**	**7460**	**5980**	**5530**	**10700**	**1710**	750	**87**	750	87
Antimony	µg/L	0.2	0.36	0.59	0.64	1.7	0.32				
Arsenic	µg/L	1	5.1	4.7	4.9	8.7	3.5	340	**150**	360	190
Barium	µg/L	38.4	56.7	51.3	53.5	84.7	34.8				
Beryllium	µg/L	0.13	0.44	0.32	0.29	0.51	0.058				
Cadmium	µg/L	ND	ND	ND	ND	0.18	ND				
Calcium	µg/L	26700	20800	22900	24500	37100	28500				
Chromium	µg/L	10.3	19.7	18.8	18.2	33.5	8.1				
Cobalt	µg/L	1.5	4.2	3.9	4	7.7	1				
Copper	µg/L	4.7	10.3	9.1	9.6	17.2	2.9				
Iron	µg/L	3580	10000	9380	9240	17300	2520				
Lead	µg/L	5.1	15.9	13.7	14.2	27.2	3.5				
Magnesium	µg/L	47900	20600	22000	22200	61200	42400				
Manganese	µg/L	164	494	473	528	855	107				
Mercury	**ng/L**	Not sampled	Not sampled	**42.6**	**28.8**	**59.8**	10	1400	77	2400	**12**
Nickel	µg/L	3.9	8.8	8.3	8.3	15.5	2.7				
Potassium	µg/L	13800	7440	7670	7860	20600	13600				
Selenium	µg/L	1.4	0.67	0.74	0.98	3	1.2	20	**5.0**	20	5.0
Silver	µg/L	0.037	0.11	0.079	0.077	0.14	ND				
Sodium	µg/L	343000	126000	137000	137000	460000	336000				
Thallium	µg/L	0.04	0.15	0.091	0.12	0.16	0.068				
Vanadium	µg/L	10.1	17	15.8	15	29.4	7				
Zinc	µg/L	29.2	67.1	57.9	59.8	132	34.4				
Cyanide	µg/L	**11.4**	ND	ND	ND	1.9	ND	22	5.2	22	**5.2**

2.2.2 Pesticides and PCB Aroclors

Table 2-11 presents background pesticide and PCB Aroclor data. Two of the five background samples had chronic exceedances of pesticides. A background sample collected on April 6, 2010 had a dieldrin concentration of 0.0035 µg/L, which is 3.5 parts per trillion. That concentration is above the DRBC freshwater chronic criterion of 0.0019 µg/L but below the DNREC chronic criterion of 0.056 µg/L. That same background water sample had a heptachlor concentration of 0.0085 µg/L. That concentration is above the DRBC and DNREC freshwater chronic criterion of 0.0038 µg/L. A background water sample collected on May 11, 2010 had a 4,4-DDD concentration of 0.0012 µg/L. That concentration is above the DRBC and DNREC freshwater chronic criterion of 0.001 µg/L. PCB Aroclors were not detected in any of the five samples.

Tables 2-12 and 2-13 present pesticide and PCB Aroclor data for the weir discharge points of cells 2 and 3. There were no detections of pesticides or PCB Aroclors above the lowest of the DNREC or DRBC acute criteria. The pesticides 4,4-DDD, 4,4-DDE, 4,4-DDT, dieldrin and endrin were detected above the lowest of the DNREC or DRBC chronic criteria at the weir discharge point of cell 2 (Table 2-12). The pesticide 4,4-DDD was detected in one of 15 samples at a concentration of 0.0053 µg/L, which is above the DNREC and DRBC chronic criterion of 0.001 µg/L. The pesticide 4,4-DDE was detected in three of 15 samples at concentrations of 0.0012, 0.0018 and 0.0059 µg/L, which are above the DNREC and DRBC chronic criterion of 0.001 µg/L. The pesticide 4,4-DDT was detected in three of 15 samples at a concentration of 0.0018, 0.018 and 0.0019 µg/L, which are above the DNREC and DRBC chronic criterion of 0.001 µg/L. The pesticide dieldrin was detected in one of 15 samples at a concentration of 0.013 µg/L, which is above the DRBC chronic criterion of 0.0019 µg/L but below the DNREC chronic criterion of 0.056 µg/L. The pesticide endrin was detected in one of 15 samples at a concentration of 0.013 µg/L, which is above the DRBC chronic criterion of 0.0023 µg/L but below the DNREC chronic criterion of 0.036 µg/L. For cell 3, only the pesticide heptachlor was detected above the DNREC and DRBC chronic criterion (Table 2-13). Heptachlor was detected in two of six samples at concentrations of 0.0044 and 0.0068 µg/L, which are above the DNREC and DRBC chronic criterion of 0.0038 µg/L. PCB Aroclor 1242 was detected in one of 15 samples for cell 2 at a concentration of 0.044 µg/L (Table 2-12). This concentration is above the DNREC and DRBC chronic criterion for total PCBs, which is 0.014 µg/L. No other PCB Aroclors were detected in Cells 2 and 3.

Tables 2-14 and 2-15 present pesticide and PCB Aroclor data for the mix samples collected for cells 2 and 3. No pesticides were detected above acute criteria. The pesticides 4,4-DDE and 4,4-DDT were detected above the DNREC and DRBC chronic criteria at the mix sample location for cell 2 (Table 2-14). The pesticide 4,4-DDE was detected in one of six samples at a concentration of 0.0024 µg/L, which is above the DNREC and DRBC chronic criterion of 0.001 µg/L. The pesticide 4,4-DDT was detected in two of six samples at concentrations of 0.0028 and 0.0027 µg/L, which are above the DNREC and DRBC chronic criterion of 0.001 µg/L. For cell 3, only the pesticide 4,4-DDT was detected above the DNREC and DRBC chronic criterion (Table 2-15). The pesticide 4,4-DDT was detected in one of four samples at a concentration of

Table 2-11. Killcohook Background Pesticide and PCB Aroclor Data

Sample ID Lab Report ID		BG0402 C0D060501002	BG0406 C0D070526002	BG0504 C0E060542002	BG0511 C0E120504002	BG0517 C0E180492002	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/2/2010	4/6/2010	5/4/2010	5/11/2010	5/17/2010				
Analyte	**Unit**									
4,4-DDD	µg/L	ND	ND	ND	**0.0012**	ND	1.1	0.001	0.55	**0.001**
4,4-DDE	µg/L	ND	ND	ND	ND	ND	1.1	0.001	0.55	**0.001**
4,4-DDT	µg/L	ND	ND	ND	ND	ND	1.1	0.001	0.55	**0.001**
Aldrin	µg/L	ND	ND	ND	ND	ND	3.0	none	1.5	**none**
alpha-BHC	µg/L	ND	0.0016	ND	ND	ND				
alpha-Chlordane	µg/L	ND	ND	ND	ND	ND				
Aroclor 1016	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1221	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1232	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1242	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1248	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1254	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1260	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
beta-BHC	µg/L	ND	0.007	ND	0.003	0.0015				
Chlordane (technical)	µg/L	ND	ND	ND	ND	ND	2.4	0.0043	1.2	**0.0043**
Chlorpyrifos	µg/L	ND	ND	ND	ND	ND	0.083	0.041	0.083	**0.041**
delta-BHC	µg/L	ND	0.0039	ND	ND	0.00058				
Dieldrin	µg/L	0.0011	**0.0035**	ND	0.00085	ND	0.24	0.056	1.25	**0.0019**
Endosulfan I	µg/L	ND	ND	ND	ND	ND	0.22	0.056	0.11	**0.056**
Endosulfan II	µg/L	0.0013	0.0026	ND	0.0019	0.0015	0.22	0.056	0.11	**0.056**
Endosulfan sulfate	µg/L	ND	0.0026	ND	ND	ND				
Endrin	µg/L	ND	ND	ND	ND	ND	0.086	0.036	0.09	**0.0023**
Endrin aldehyde	µg/L	ND	0.0018	ND	ND	ND				
Endrin ketone	µg/L	ND	0.0021	ND	ND	ND				
gamma-BHC (Lindane)	µg/L	0.00077	0.0047	ND	0.0013	0.002	none	none	1.0	**0.08**
gamma-Chlordane	µg/L	ND	0.0019	ND	ND	ND				
Heptachlor	µg/L	0.0013	**0.0085**	ND	ND	0.0014	0.52	0.0038	0.26	**0.0038**
Heptachlor epoxide	µg/L	ND	ND	ND	ND	ND				
Methoxychlor	µg/L	ND	ND	ND	ND	ND	none	**0.03**	none	none
Parathion	µg/L	ND	ND	ND	ND	ND	0.065	0.013	0.065	**0.013**
Toxaphene	µg/L	ND	ND	ND	ND	ND	0.73	0.0002	0.73	**0.0002**

Table 2-12. Killcohook Cell 2 Weir Pesticide and PCB Aroclor Data

Sample ID Lab Report ID		WIER0318 C0C190563007	WIER0322 C0C230507002	WIER0324 C0C250605003	WIER0329 C0C300513003	WIER0402 C0D060501004	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		3/18/2010	3/22/2010	3/24/2010	3/29/2010	4/2/2010				
Analyte	**Unit**									
4,4-DDD	µg/L	0.00073	ND	ND	ND	0.00087	1.1	0.001	0.55	**0.001**
4,4-DDE	µg/L	**0.0012**	ND	ND	ND	**0.0018**	1.1	0.001	0.55	**0.001**
4,4-DDT	µg/L	**0.0018**	ND	ND	ND	ND	1.1	0.001	0.55	**0.001**
Aldrin	µg/L	ND	ND	ND	ND	ND	3.0	none	1.5	**none**
alpha-BHC	µg/L	0.0027	ND	ND	0.001	ND				
alpha-Chlordane	µg/L	ND	ND	ND	ND	ND				
Aroclor 1016	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1221	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1232	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1242	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1248	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1254	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1260	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
beta-BHC	µg/L	0.0068	0.0097	ND	0.0031	ND				
Chlordane (technical)	µg/L	ND	ND	ND	ND	ND	2.4	0.0043	1.2	**0.0043**
Chlorpyrifos	µg/L	ND	ND	ND	ND	ND	0.083	0.041	0.083	**0.041**
delta-BHC	µg/L	0.00097	ND	ND	0.0014	0.00073				
Dieldrin	µg/L	0.0012	ND	ND	ND	ND	0.24	0.056	1.25	**0.0019**
Endosulfan I	µg/L	0.0012	ND	ND	ND	ND	0.22	0.056	0.11	**0.056**
Endosulfan II	µg/L	ND	ND	ND	ND	0.0011	0.22	0.056	0.11	**0.056**
Endosulfan sulfate	µg/L	ND	ND	ND	ND	ND				
Endrin	µg/L	ND	ND	ND	ND	ND	0.086	0.036	0.09	**0.0023**
Endrin aldehyde	µg/L	ND	ND	ND	ND	ND				
Endrin ketone	µg/L	ND	ND	ND	ND	ND				
gamma-BHC (Lindane)	µg/L	ND	ND	ND	ND	ND	none	none	1.0	**0.08**
gamma-Chlordane	µg/L	0.0015	ND	ND	0.0047	ND				
Heptachlor	µg/L	ND	ND	ND	ND	ND	0.52	0.0038	0.26	**0.0038**
Heptachlor epoxide	µg/L	ND	ND	ND	ND	ND				
Methoxychlor	µg/L	0.00093	ND	ND	ND	ND	none	**0.03**	none	none
Parathion	µg/L	ND	ND	ND	ND	ND	0.065	0.013	0.065	**0.013**
Toxaphene	µg/L	ND	ND	ND	ND	ND	0.73	0.0002	0.73	**0.0002**

Table 2-12. (Continued)

Sample ID Lab Report ID		WIER0406 C0D070526004	WIER0408 C0D090487003	WIER0414 C0D150544003	WIER0419 C0D200485002	WIER0422 C0D230554002	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/6/2010	4/8/2010	4/14/2010	4/19/2010	4/22/2010				
Analyte	**Unit**									
4,4-DDD	µg/L	ND	ND	ND	ND	**0.0053**	1.1	0.001	0.55	**0.001**
4,4-DDE	µg/L	ND	ND	ND	ND	**0.0059**	1.1	0.001	0.55	**0.001**
4,4-DDT	µg/L	ND	ND	ND	ND	**0.018**	1.1	0.001	0.55	**0.001**
Aldrin	µg/L	ND	ND	0.0014	ND	ND	3.0	none	1.5	**none**
alpha-BHC	µg/L	0.0013	0.001	0.00081	ND	0.0048				
alpha-Chlordane	µg/L	ND	ND	ND	ND	ND				
Aroclor 1016	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1221	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1232	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1242	µg/L	ND	ND	ND	ND	**0.044**	none	0.014	1.0	**0.014**
Aroclor 1248	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1254	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1260	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
beta-BHC	µg/L	0.0031	ND	ND	ND	ND				
Chlordane (technical)	µg/L	ND	ND	ND	ND	ND	2.4	0.0043	1.2	**0.0043**
Chlorpyrifos	µg/L	ND	ND	ND	ND	ND	0.083	0.041	0.083	**0.041**
delta-BHC	µg/L	ND	0.00057	0.00053	ND	0.0074				
Dieldrin	µg/L	ND	ND	ND	ND	**0.013**	0.24	0.056	1.25	**0.0019**
Endosulfan I	µg/L	ND	ND	ND	ND	ND	0.22	0.056	0.11	**0.056**
Endosulfan II	µg/L	ND	ND	ND	ND	ND	0.22	0.056	0.11	**0.056**
Endosulfan sulfate	µg/L	0.0027	ND	ND	ND	ND				
Endrin	µg/L	ND	ND	ND	ND	**0.013**	0.086	0.036	0.09	**0.0023**
Endrin aldehyde	µg/L	ND	ND	ND	ND	ND				
Endrin ketone	µg/L	ND	ND	ND	ND	ND				
gamma-BHC (Lindane)	µg/L	0.0023	ND	ND	ND	ND	none	none	1.0	**0.08**
gamma-Chlordane	µg/L	ND	ND	ND	ND	ND				
Heptachlor	µg/L	0.0031	0.0023	ND	ND	0.0082	0.52	0.0038	0.26	**0.0038**
Heptachlor epoxide	µg/L	0.0065	ND	ND	ND	ND				
Methoxychlor	µg/L	ND	ND	ND	ND	0.012	none	**0.03**	none	none
Parathion	µg/L	ND	ND	ND	ND	ND	0.065	0.013	0.065	**0.013**
Toxaphene	µg/L	ND	ND	ND	ND	ND	0.73	0.0002	0.73	**0.0002**

Table 2-12. (Contiinued)

Sample ID Lab Report ID		WIER0427 C0D280512003	WIER0504 C0E060542004	WEIR0506 C0E070494003	WIER0511 C0E120504003	WIER0517 C0E180492004	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/27/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**									
4,4-DDD	µg/L	ND	ND	ND	ND	ND	1.1	0.001	0.55	**0.001**
4,4-DDE	µg/L	0.00087	ND	0.00081	ND	ND	1.1	0.001	0.55	**0.001**
4,4-DDT	µg/L	ND	ND	**0.0019**	ND	ND	1.1	0.001	0.55	**0.001**
Aldrin	µg/L	ND	ND	ND	ND	ND	3.0	none	1.5	**none**
alpha-BHC	µg/L	ND	ND	ND	ND	0.00088				
alpha-Chlordane	µg/L	ND	ND	ND	ND	ND				
Aroclor 1016	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1221	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1232	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1242	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1248	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1254	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1260	µg/L	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
beta-BHC	µg/L	ND	ND	0.0025	0.0021	ND				
Chlordane (technical)	µg/L	ND	ND	ND	ND	ND	2.4	0.0043	1.2	**0.0043**
Chlorpyrifos	µg/L	ND	ND	ND	ND	ND	0.083	0.041	0.083	**0.041**
delta-BHC	µg/L	0.0018	ND	0.0024	0.0011	0.00063				
Dieldrin	µg/L	ND	ND	ND	ND	ND	0.24	0.056	1.25	**0.0019**
Endosulfan I	µg/L	ND	ND	ND	ND	ND	0.22	0.056	0.11	**0.056**
Endosulfan II	µg/L	ND	ND	ND	0.0014	ND	0.22	0.056	0.11	**0.056**
Endosulfan sulfate	µg/L	ND	ND	ND	ND	ND				
Endrin	µg/L	ND	ND	ND	ND	ND	0.086	0.036	0.09	**0.0023**
Endrin aldehyde	µg/L	ND	ND	ND	ND	ND				
Endrin ketone	µg/L	ND	ND	ND	ND	ND				
gamma-BHC (Lindane)	µg/L	0.0013	ND	0.0025	0.0034	0.0047	none	none	1.0	**0.08**
gamma-Chlordane	µg/L	ND	ND	0.0011	0.0012	ND				
Heptachlor	µg/L	0.0033	ND	0.0081	0.0083	0.0033	0.52	0.0038	0.26	**0.0038**
Heptachlor epoxide	µg/L	ND	ND	0.001	ND	ND				
Methoxychlor	µg/L	ND	ND	ND	ND	ND	none	**0.03**	none	none
Parathion	µg/L	ND	ND	ND	ND	ND	0.065	0.013	0.065	**0.013**
Toxaphene	µg/L	ND	ND	ND	ND	ND	0.73	0.0002	0.73	**0.0002**

Table 2-13. Killcohook Cell 3 Weir Pesticide and PCB Aroclor Data

Sample ID Lab Report ID		WIER0427 C0D280518003	WIER0429 C0D300570003	WIER0504 C0E060543003	WIER0506 C0E070562003	WIER0511 C0E120515002	WIER0517 C0E180515003	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/27/2010	4/29/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**										
GCSEMI											
4,4-DDD	µg/L	ND	ND	ND	ND	ND	ND	1.1	0.001	0.55	**0.001**
4,4-DDE	µg/L	ND	ND	ND	ND	ND	ND	1.1	0.001	0.55	**0.001**
4,4-DDT	µg/L	ND	ND	ND	ND	ND	ND	1.1	0.001	0.55	**0.001**
Aldrin	µg/L	ND	ND	ND	ND	ND	ND	3.0	none	1.5	**none**
alpha-BHC	µg/L	0.00083	ND	ND	ND	ND	ND				
alpha-Chlordane	µg/L	ND	ND	ND	ND	ND	ND				
Aroclor 1016	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1221	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1232	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1242	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1248	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1254	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1260	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
beta-BHC	µg/L	ND	ND	ND	ND	ND	ND				
Chlordane (technical)	µg/L	ND	ND	ND	ND	ND	ND	2.4	0.0043	1.2	**0.0043**
Chlorpyrifos	µg/L	ND	ND	ND	ND	ND	ND	0.083	0.041	0.083	**0.041**
delta-BHC	µg/L	ND	0.00053	ND	ND	ND	0.00062				
Dieldrin	µg/L	ND	0.0011	ND	ND	ND	ND	0.24	0.056	1.25	**0.0019**
Endosulfan I	µg/L	ND	ND	ND	ND	ND	ND	0.22	0.056	0.11	**0.056**
Endosulfan II	µg/L	ND	0.0014	ND	ND	0.0016	ND	0.22	0.056	0.11	**0.056**
Endosulfan sulfate	µg/L	ND	ND	ND	ND	ND	ND				
Endrin	µg/L	ND	ND	ND	ND	ND	ND	0.086	0.036	0.09	**0.0023**
Endrin aldehyde	µg/L	ND	ND	ND	ND	ND	ND				
Endrin ketone	µg/L	ND	ND	ND	ND	ND	ND				
gamma-BHC (Lindane)	µg/L	0.0016	ND	ND	ND	ND	0.0038	none	none	1.0	**0.08**
gamma-Chlordane	µg/L	ND	ND	ND	0.018	ND	ND				
Heptachlor	µg/L	0.0014	**0.0044**	0.0019	**0.0068**	0.0024	0.0037	0.52	0.0038	0.26	**0.0038**
Heptachlor epoxide	µg/L	ND	ND	ND	ND	ND	ND				
Methoxychlor	µg/L	ND	ND	ND	0.0048	ND	ND	none	**0.03**	none	none
Parathion	µg/L	ND	ND	ND	ND	ND	ND	0.065	0.013	0.065	**0.013**
Toxaphene	µg/L	ND	ND	ND	ND	ND	ND	0.73	0.0002	0.73	**0.0002**

Table 2-14. Killcohook Cell 2 Mix Pesticide and PCB Aroclor Data

Sample ID Lab Report ID		MIX0402 C0D060501001	MIX0406 C0D070526001	MIX0504 C0E060542001	MIX0506 C0E070494001	MIX0511 C0E120504001	MIX0517 C0E180492001	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		4/2/2010	4/6/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**										
4,4-DDD	µg/L	ND	ND	ND	ND	ND	ND	1.1	0.001	0.55	**0.001**
4,4-DDE	µg/L	0.00078	**0.0024**	0.00089	0.00087	0.00078	ND	1.1	0.001	0.55	**0.001**
4,4-DDT	µg/L	ND	**0.0028**	ND	**0.0027**	ND	ND	1.1	0.001	0.55	**0.001**
Aldrin	µg/L	ND	ND	ND	ND	ND	ND	3.0	none	1.5	**none**
alpha-BHC	µg/L	ND	0.0014	ND	ND	ND	ND				
alpha-Chlordane	µg/L	ND	ND	ND	ND	ND	ND				
Aroclor 1016	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1221	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1232	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1242	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1248	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1254	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1260	µg/L	ND	ND	ND	ND	ND	ND	none	0.014	1.0	**0.014**
beta-BHC	µg/L	ND	0.0042	0.001	0.0018	0.003	0.0017				
Chlordane (technical)	µg/L	ND	ND	ND	ND	ND	ND	2.4	0.0043	1.2	**0.0043**
Chlorpyrifos	µg/L	ND	ND	ND	ND	ND	ND	0.083	0.041	0.083	**0.041**
delta-BHC	µg/L	ND	0.0012	0.00059	ND	0.0011	0.0013				
Dieldrin	µg/L	0.0013	ND	ND	0.001	0.001	ND	0.24	0.056	1.25	**0.0019**
Endosulfan I	µg/L	ND	ND	ND	ND	ND	ND	0.22	0.056	0.11	**0.056**
Endosulfan II	µg/L	0.00095	ND	ND	0.0013	0.0022	ND	0.22	0.056	0.11	**0.056**
Endosulfan sulfate	µg/L	ND	0.0015	ND	ND	ND	ND				
Endrin	µg/L	ND	0.0019	ND	ND	ND	ND	0.086	0.036	0.09	**0.0023**
Endrin aldehyde	µg/L	ND	0.002	ND	ND	ND	ND				
Endrin ketone	µg/L	ND	ND	ND	ND	ND	ND				
gamma-BHC (Lindane)	µg/L	0.001	0.0021	0.00094	ND	0.0017	0.0023	none	none	1.0	**0.08**
gamma-Chlordane	µg/L	ND	0.0048	ND	0.0063	ND	ND				
Heptachlor	µg/L	0.0017	0.0036	ND	ND	0.0018	ND	0.52	0.0038	0.26	**0.0038**
Heptachlor epoxide	µg/L	ND	ND	ND	ND	ND	ND				
Methoxychlor	µg/L	ND	0.014	ND	0.0055	ND	ND	none	**0.03**	none	none
Parathion	µg/L	ND	ND	ND	ND	ND	ND	0.065	0.013	0.065	**0.013**
Toxaphene	µg/L	ND	ND	ND	ND	ND	ND	0.73	0.0002	0.73	**0.0002**

Table 2-15. Killcohook Cell 3 Mix Pesticide and PCB Aroclor Data

Sample ID Lab Report ID		MIX0504 C0E060543001	MIX0506 C0E070562001	MIX0511 C0E120515001	MIX0517 C0E180515001	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Sample Date		5/4/2010	5/6/2010	5/11/2010	5/17/2010				
Analyte	**Unit**								
4,4-DDD	µg/L	ND	ND	0.00086	ND	1.1	0.001	0.55	**0.001**
4,4-DDE	µg/L	ND	ND	0.001	ND	1.1	0.001	0.55	**0.001**
4,4-DDT	µg/L	ND	**0.0023**	ND	ND	1.1	0.001	0.55	**0.001**
Aldrin	µg/L	ND	ND	ND	ND	3.0	none	1.5	**none**
alpha-BHC	µg/L	ND	ND	ND	ND				
alpha-Chlordane	µg/L	ND	ND	ND	ND				
Aroclor 1016	µg/L	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1221	µg/L	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1232	µg/L	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1242	µg/L	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1248	µg/L	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1254	µg/L	ND	ND	ND	ND	none	0.014	1.0	**0.014**
Aroclor 1260	µg/L	ND	ND	ND	ND	none	0.014	1.0	**0.014**
beta-BHC	µg/L	ND	0.0021	0.0031	0.0016				
Chlordane (technical)	µg/L	ND	ND	ND	ND	2.4	0.0043	1.2	**0.0043**
Chlorpyrifos	µg/L	ND	ND	ND	ND	0.083	0.041	0.083	**0.041**
delta-BHC	µg/L	ND	ND	ND	0.0005				
Dieldrin	µg/L	ND	ND	ND	ND	0.24	0.056	1.25	**0.0019**
Endosulfan I	µg/L	ND	ND	ND	ND	0.22	0.056	0.11	**0.056**
Endosulfan II	µg/L	ND	0.0014	0.0014	0.0012	0.22	0.056	0.11	**0.056**
Endosulfan sulfate	µg/L	ND	ND	ND	ND				
Endrin	µg/L	ND	ND	ND	ND	0.086	0.036	0.09	**0.0023**
Endrin aldehyde	µg/L	ND	ND	ND	ND				
Endrin ketone	µg/L	ND	ND	ND	ND				
gamma-BHC (Lindane)	µg/L	ND	0.00094	0.0012	0.0019	none	none	1.0	**0.08**
gamma-Chlordane	µg/L	ND	0.00096	ND	ND				
Heptachlor	µg/L	ND	ND	ND	0.0025	0.52	0.0038	0.26	**0.0038**
Heptachlor epoxide	µg/L	ND	ND	ND	ND				
Methoxychlor	µg/L	ND	0.0042	ND	ND	none	**0.03**	none	none
Parathion	µg/L	ND	ND	ND	ND	0.065	0.013	0.065	**0.013**
Toxaphene	µg/L	ND	ND	ND	ND	0.73	0.0002	0.73	**0.0002**

0.0023 µg/L, which is above the DNREC and DRBC chronic criterion of 0.001 µg/L. PCB Aroclors were not detected in any of the mix samples.

There were no pesticide detections above DRBC or DNREC freshwater acute criteria for the protection of aquatic life. This indicates that the dredged material disposal operations are not impacting water quality close to the discharges relative to pesticides and PCBs. There were infrequent detections of six pesticides above DRBC chronic criteria. Dieldrin, endrin and DDD were each detected once and heptachlor was detected twice. Heptachlor was detected twice in cell 3 weir discharge samples at concentrations above the DNREC and DRBC chronic criterion of 0.0038 µg/L. The cell 3 weir concentrations were 0.0044 and 0.0068 µg/L. A background water sample collected on April 6, 2010 had a higher heptachlor concentration (0.0085 µg/L). Dieldrin and endrin were each detected in one sample collected at the cell 2 weir discharge on April 22, 2010. Dieldrin was detected at a concentration of 0.013 µg/L, which is above the DRBC chronic criterion of 0.0019 µg/L but below the DNREC and USEPA chronic criterion of 0.056 µg/L. Endrin was also detected at a concentration of 0.013 µg/L, which is above the DRBC chronic criterion of 0.0023 µg/L but below the DNREC and USEPA chronic criterion of 0.036 µg/L. 4,4-DDD was only detected once at a concentration above the DRBC and DNREC chronic criteria of 0.001 µg/L. 4,4-DDD was detected at a concentration of 0.0053 µg/L in the April 22, 2010 cell 2 weir discharge sample. 4,4-DDD was also detected above the chronic criterion in a May 11, 2010 background water sample (0.0012 µg/L). 4,4-DDE and 4,4-DDT were the most frequently detected pesticides above the DRBC and DNREC chronic criterion of 0.001 µg/L. 4,4-DDE and 4,4-DDT were detected four and six times, respectively. 4,4-DDE was detected three times above the chronic criterion at the cell 2 weir discharge at concentrations of 0.0012, 0.0018 and 0.0059 µg/L. 4,4-DDE was only detected once above the chronic criterion in Delaware River mix samples at a concentration of 0.0024 µg/L. 4,4-DDT was also detected three times above the chronic criterion at the cell 2 weir discharge at concentrations of 0.0018, 0.0019 and 0.018 µg/L. 4,4-DDT was detected above the chronic criterion three times in Delaware River mix samples at concentrations of 0.0028, 0.0027 and 0.0023 µg/L. Concentrations of 4,4-DDE and 4,4-DDT in Delaware River mix samples were less than three times the chronic criterion. Considering that 1) no pesticide acute criteria were exceeded and that infrequent chronic exceedances occurred at the weir discharges (one to three depending on the pesticide), that 2) only 4,4-DDE and 4,4-DDT were detected above the chronic criteria in Delaware River mix samples at concentrations less than three times the chronic criterion, and 3) the volume of Delaware River water that completely mixes with the weir discharge water at this location, it is concluded that operation of cells 2 and 3 of the Killcohook dredged material containment facility is not impacting Delaware River water quality relative to pesticides from both "near-field" and "far-field" perspectives.

Only one sample had a PCB Aroclor detection. The April 22, 2010 cell 2 weir discharge sample had a detection of PCB Aroclor 1242 at a concentration of 0.044 µg/L. This concentration was above the DRBC and DNREC chronic criterion of 0.014 µg/L for total PCBs. High resolution PCB and Dioxin analyses were conducted on the March 29 and April 14 cell 2 weir discharge samples. While there are no water quality criteria for Dioxins, the sum of PCB

congeners were orders of magnitude below DNREC and DRBC acute and chronic criterion (Table 2-16).

Table 2-16. Killcohook Cell 2 Weir PCB Congener and Dioxin Data

Sample ID:		**WIER0329**	**WIER0414**				
Laboratory ID:		**C0C300513003**	**C0D150544003**				
Sample Date:		3/29/2010	4/14/2010				
				DNREC	**DNREC**	**DRBC**	**DRBC**
				Acute	**Chronic**	**Acute**	**Chronic**
Monochlorobiphenyl (total)	ng/L	0.05	0.019				
Dichlorobiphenyl (total)	ng/L	0.51	0.19				
Trichlorobiphenyl (total)	ng/L	1.4	0.32				
Tetrachlorobiphenyl (total)	ng/L	3.8	0.85				
Pentachlorobiphenyl (total)	ng/L	5.2	1.3				
Hexachlorobiphenyl (total)	ng/L	3.5	1.1				
Heptachlorobiphenyl (total)	ng/L	1.7	0.57				
Octachlorobiphenyl (total)	ng/L	0.97	0.37				
Nonachlorobiphenyl (total)	ng/L	2.2	0.91				
Decachlorobiphenyl (total)	ng/L	3.1	1.1				
Sum of PCB Congeners	ng/L	22.43	6.729	none	14,000	1,000,000	14,000
Total HpCDD	ng/L	0.4	0.24				
Total HpCDF	ng/L	0.042	0.024				
Total HxCDD	ng/L	0.067	0.062				
Total HxCDF	ng/L	0.018	0.012				
Total PeCDD	ng/L	<0.048	<0.048				
Total PeCDF	ng/L	0.0067	0.0081				
Total TCDD	ng/L	0.0044	<0.0095				
Total TCDF	ng/L	0.01	0.0074				
OCDD	ng/L	2.8	1.8				
OCDF	ng/L	0.051	0.031				
Sum of Dioxin Homologs	ng/L	3.3991	2.1845				

2.2.3 Semi-Volatile Organic Compounds

Semi-volatile organic data are presented for background samples (Table 2-17), cell 2 weir discharge samples (Table 2-18), cell 3 weir discharge samples (Table 2-19), cell 2 mix samples (Table 2-20) and cell 3 mix samples (Table 2-21). The only semi-volatile organic compound with established water quality criteria is pentachlorophenol. DRBC and DNREC criteria for pentachlorophenol are calculated using formulas that include the pH of the water. To make these calculations, a pH of 7.0 was assumed. Using a pH of 7.0, the lowest freshwater criterion for pentachlorophenol is the DRBC chronic criterion of 5.73 µg/L. Pentachlorophenol was detected at a concentration of 3 µg/L in one cell 2 weir discharge sample (Table 2-18) and at a concentration of 0.08 µg/L in one cell 2 mix sample (Table 2-20). These concentrations are below the DRBC chronic criterion of 5.73 µg/L.

The most frequently detected semi-volatile organic compounds were polynuclear aromatic hydrocarbons (PAHs) including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. PAHs are one of the most widespread organic pollutants. In addition to their presence in fossil fuels, they are also formed by incomplete combustion of carbon containing fuels such as coal, oil and gas, diesel, wood, garbage, or other organic substances like tobacco or charbroiled meat. PAHs do not dissolve easily in water and are most likely attached to suspended sediment in the Delaware River. All the PAHs listed above, except fluorene, were detected in background water samples within the same general range of concentrations (i.e. hundredths to tenths of a part per billion). Although one cell 2 mix water sample collected on May 17, 2010 did have some higher concentrations (i.e. on the order of 1 to 2 parts per billion). Fluorene was detected in three cell 2 weir discharge samples, three cell 2 mix samples and one cell 3 mix sample at a concentration range of 0.02 to 0.11 parts per billion. The presence of PAHs in the weir discharge water and in the mix water is not considered to be a result of dredging or dredged material disposal operations.

A second group of frequently detected semi-volatile organic compounds were phthalates including bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate and diethyl phthalate. Phthalates are used in the manufacturing of adhesives and glues, building materials, personal care products, medical devices, detergents and surfactants, packaging, children's toys, modeling clay, waxes, paints, printing inks and coatings, pharmaceuticals, food products, and textiles. Phthalates are easily released into the environment. As plastics age and break down the release of phthalates accelerates. All the phthalates listed above were detected in background water samples within the same general range of concentrations (i.e. tenths to a few parts per billion). One cell 2 weir discharge sample collected on May 17, 2010 did have a concentration of bis(2-ethylhexyl) phthalate of 11 parts per billion. Like PAHs, because phthalates were detected at similar concentrations in background water samples their presence in weir discharge water and in the mix water is not considered to be a result of dredging or dredged material disposal operations.

Other frequently detected semi-volatile organic compounds include 2-methylnaphthalene, acetophenone, benzaldehyde and caprolactam. 2-Methylnaphthalene is a component of crude oil and a product of combustion, which is produced and released to the environment during natural fires. Emissions from petroleum refining, coal tar distillation, and gasoline and diesel fueled engines are major contributors of 2-methylnaphthalene to the environment. Acetophenone is used in perfume manufacture, as a flavorant in tobacco and in the synthesis of pharmaceuticals. Benzaldehyde is used in the manufacture of perfumes, dyes and flavors. Caprolactam is used in the manufacture of nylon and plastics. These organic compounds were also found in background samples at similar concentration ranges. Several other semi-volatile organic compounds were detected infrequently (i.e. one to four detections out of a total of 36 samples). Overall it is concluded that operation of cells 2 and 3 of the Killcohook dredged material containment facility is not impacting Delaware River water quality relative to semi-volatile organic compounds.

Table 2-17. Killcohook background Semi-volatile Organic Data.

Sample ID Lab Report ID		BG0402 C0D060501002	BG0406 C0D070526002	BG0504 C0E060542002	BG0511 C0E120504002	BG0517 C0E180492002
Sample Date		4/2/2010	4/6/2010	5/4/2010	5/11/2010	5/17/2010
Analyte	**Unit**					
1,1-Biphenyl	µg/L	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	0.074	ND
1,2-Diphenylhydrazine	µg/L	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dimethylphenol	µg/L	ND	ND	ND	ND	ND
2,4-Dinitrophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND
2-Chloronaphthalene	µg/L	ND	ND	ND	ND	ND
2-Chlorophenol	µg/L	ND	ND	ND	ND	ND
2-Methylnaphthalene	µg/L	ND	0.017	ND	ND	ND
2-Methylphenol	µg/L	ND	ND	ND	ND	ND
2-Nitroaniline	µg/L	ND	ND	ND	ND	ND
2-Nitrophenol	µg/L	ND	ND	ND	ND	ND
3,3-Dichlorobenzidine	µg/L	ND	ND	ND	ND	ND
3-Nitroaniline	µg/L	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	µg/L	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	µg/L	ND	ND	ND	ND	ND
4-Chloroaniline	µg/L	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND
4-Methylphenol	µg/L	ND	ND	ND	ND	ND
4-Nitroaniline	µg/L	ND	ND	ND	ND	ND
4-Nitrophenol	µg/L	ND	ND	ND	ND	ND
Acetophenone	µg/L	ND	0.35	ND	ND	0.37
Benzaldehyde	µg/L	0.79	0.57	0.56	0.81	0.63
Benzidine	µg/L	ND	ND	ND	ND	ND
Benzo(a)anthracene	µg/L	0.073	ND	ND	ND	0.53
Benzo(a)pyrene	µg/L	0.077	ND	ND	ND	0.36
Benzo(b)fluoranthene	µg/L	0.14	ND	ND	ND	0.4
Benzo(ghi)perylene	µg/L	0.25	ND	ND	ND	0.53
Benzo(k)fluoranthene	µg/L	0.21	ND	ND	ND	0.59
bis(2-Chloroethoxy)methane	µg/L	ND	ND	ND	ND	ND

Table 2-17. (Continued)

Sample ID Lab Report ID		BG0402 C0D060501002	BG0406 C0D070526002	BG0504 C0E060542002	BG0511 C0E120504002	BG0517 C0E180492002
Sample Date		4/2/2010	4/6/2010	5/4/2010	5/11/2010	5/17/2010
Analyte	**Unit**					
bis(2-Chloroethyl) ether	µg/L	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl) ether	µg/L	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	µg/L	ND	1.1	ND	ND	4.6
Butyl benzyl phthalate	µg/L	0.13	0.71	0.15	0.34	0.29
Caprolactam	µg/L	ND	ND	ND	2.1	2.5
Carbazole	µg/L	ND	ND	ND	ND	ND
Chrysene	µg/L	0.11	ND	ND	ND	0.59
Di-n-butyl phthalate	µg/L	ND	0.41	ND	0.12	0.12
Di-n-octyl phthalate	µg/L	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	µg/L	0.23	ND	ND	ND	0.57
Dibenzofuran	µg/L	ND	ND	ND	ND	ND
Diethyl phthalate	µg/L	ND	ND	ND	0.19	0.19
Dimethyl phthalate	µg/L	ND	ND	ND	ND	ND
Fluoranthene	µg/L	0.022	0.026	0.039	0.029	0.13
Fluorene	µg/L	ND	ND	ND	ND	ND
Hexachlorobenzene	µg/L	ND	ND	ND	ND	ND
Hexachlorobutadiene	µg/L	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	µg/L	ND	ND	ND	ND	ND
Hexachloroethane	µg/L	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	µg/L	0.23	ND	ND	ND	0.56
Isophorone	µg/L	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	µg/L	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	µg/L	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	µg/L	ND	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	ND	0.02	ND
Nitrobenzene	µg/L	ND	ND	ND	ND	ND
Pentachlorophenol	µg/L	ND	ND	ND	ND	ND
Phenanthrene	µg/L	0.063	0.076	0.12	0.059	0.11
Phenol	µg/L	ND	ND	ND	ND	ND
Pyrene	µg/L	ND	0.022	0.029	0.018	0.097

Table 2-18. Killcohook Cell 2 Weir Semi-volatile Organic Data

Sample ID Lab Report ID		WIER0318 C0C190563007	WIER0322 C0C230507002	WIER0324 C0C250605003	WIER0329 C0C300513003	WIER0402 C0D060501004
Sample Date		3/18/2010	3/22/2010	3/24/2010	3/29/2010	4/2/2010
Analyte	Unit					
1,1-Biphenyl	µg/L	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	0.079	ND	ND	ND	ND
1,2-Diphenylhydrazine	µg/L	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dimethylphenol	µg/L	ND	ND	ND	ND	ND
2,4-Dinitrophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND
2-Chloronaphthalene	µg/L	ND	ND	ND	ND	ND
2-Chlorophenol	µg/L	ND	ND	ND	ND	ND
2-Methylnaphthalene	µg/L	0.019	0.014	0.013	0.015	ND
2-Methylphenol	µg/L	0.014	ND	ND	ND	ND
2-Nitroaniline	µg/L	ND	ND	ND	ND	ND
2-Nitrophenol	µg/L	ND	ND	ND	ND	ND
3,3-Dichlorobenzidine	µg/L	ND	ND	ND	ND	ND
3-Nitroaniline	µg/L	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	µg/L	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	µg/L	ND	ND	ND	ND	ND
4-Chloroaniline	µg/L	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND
4-Methylphenol	µg/L	0.029	ND	ND	ND	ND
4-Nitroaniline	µg/L	ND	ND	ND	ND	ND
4-Nitrophenol	µg/L	ND	ND	ND	ND	ND
Acetophenone	µg/L	0.033	ND	ND	ND	ND
Benzaldehyde	µg/L	0.6	ND	0.97	ND	0.8
Benzidine	µg/L	ND	ND	ND	ND	ND
Benzo(a)anthracene	µg/L	ND	0.066	ND	ND	ND
Benzo(a)pyrene	µg/L	ND	0.044	ND	ND	ND
Benzo(b)fluoranthene	µg/L	0.02	0.072	ND	ND	ND

Table 2-18. (Continued)

Sample ID Lab Report ID		WIER0318 C0C190563007	WIER0322 C0C230507002	WIER0324 C0C250605003	WIER0329 C0C300513003	WIER0402 C0D060501004
Sample Date		3/18/2010	3/22/2010	3/24/2010	3/29/2010	4/2/2010
Analyte	Unit					
Benzo(ghi)perylene	µg/L	ND	0.035	ND	ND	ND
Benzo(k)fluoranthene	µg/L	ND	0.056	ND	ND	ND
bis(2-Chloroethoxy)methane	µg/L	ND	ND	ND	ND	ND
bis(2-Chloroethyl) ether	µg/L	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl) ether	µg/L	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	µg/L	0.17	ND	ND	ND	1.6
Butyl benzyl phthalate	µg/L	ND	0.71	ND	ND	ND
Caprolactam	µg/L	ND	ND	ND	ND	ND
Carbazole	µg/L	ND	ND	ND	ND	ND
Chrysene	µg/L	ND	0.054	ND	ND	ND
Di-n-butyl phthalate	µg/L	0.097	ND	0.19	ND	ND
Di-n-octyl phthalate	µg/L	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	µg/L	ND	0.037	ND	0.099	ND
Dibenzofuran	µg/L	0.029	ND	ND	ND	ND
Diethyl phthalate	µg/L	0.089	ND	ND	ND	ND
Dimethyl phthalate	µg/L	ND	ND	ND	ND	ND
Fluoranthene	µg/L	0.033	0.029	0.023	0.022	ND
Fluorene	µg/L	0.035	0.11	ND	ND	ND
Hexachlorobenzene	µg/L	ND	ND	ND	ND	ND
Hexachlorobutadiene	µg/L	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	µg/L	ND	ND	ND	ND	ND
Hexachloroethane	µg/L	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	µg/L	ND	0.045	ND	ND	ND
Isophorone	µg/L	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	µg/L	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	µg/L	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	µg/L	ND	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	0.058	ND	0.033
Nitrobenzene	µg/L	ND	ND	ND	ND	ND
Pentachlorophenol	µg/L	ND	ND	ND	ND	ND
Phenanthrene	µg/L	0.076	0.12	0.098	0.085	0.078
Phenol	µg/L	ND	ND	ND	ND	ND
Pyrene	µg/L	0.03	0.02	0.022	ND	ND

Table 2-18. (Continued)

Sample ID Lab Report ID		WIER0406 C0D070526004	WIER0408 C0D090487003	WIER0414 C0D150544003	WIER0419 C0D200485002	WIER0422 C0D230554002
Sample Date		4/6/2010	4/8/2010	4/14/2010	4/19/2010	4/22/2010
Analyte	**Unit**					
1,1-Biphenyl	µg/L	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine	µg/L	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dimethylphenol	µg/L	ND	ND	ND	ND	ND
2,4-Dinitrophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND
2-Chloronaphthalene	µg/L	ND	ND	ND	ND	ND
2-Chlorophenol	µg/L	ND	ND	ND	ND	ND
2-Methylnaphthalene	µg/L	0.018	0.015	ND	ND	ND
2-Methylphenol	µg/L	ND	ND	ND	ND	ND
2-Nitroaniline	µg/L	ND	ND	ND	ND	ND
2-Nitrophenol	µg/L	ND	ND	ND	ND	ND
3,3-Dichlorobenzidine	µg/L	ND	ND	ND	ND	ND
3-Nitroaniline	µg/L	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	µg/L	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	µg/L	ND	ND	ND	ND	ND
4-Chloroaniline	µg/L	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND
4-Methylphenol	µg/L	ND	ND	ND	ND	ND
4-Nitroaniline	µg/L	ND	ND	ND	ND	ND
4-Nitrophenol	µg/L	ND	ND	ND	ND	ND
Acetophenone	µg/L	0.36	ND	ND	0.37	0.36
Benzaldehyde	µg/L	0.61	0.82	0.6	0.67	0.6
Benzidine	µg/L	ND	ND	ND	ND	ND
Benzo(a)anthracene	µg/L	ND	ND	ND	ND	ND
Benzo(a)pyrene	µg/L	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	µg/L	ND	ND	ND	ND	ND
Benzo(ghi)perylene	µg/L	ND	ND	ND	ND	ND

Table 2-18. (Continued)

Sample ID Lab Report ID		WIER0406 C0D070526004	WIER0408 C0D090487003	WIER0414 C0D150544003	WIER0419 C0D200485002	WIER0422 C0D230554002
Sample Date		4/6/2010	4/8/2010	4/14/2010	4/19/2010	4/22/2010
Analyte	Unit					
Benzo(k)fluoranthene	µg/L	ND	ND	ND	ND	ND
bis(2-Chloroethoxy)methane	µg/L	ND	ND	ND	ND	ND
bis(2-Chloroethyl) ether	µg/L	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl) ether	µg/L	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	µg/L	ND	2.1	ND	ND	ND
Butyl benzyl phthalate	µg/L	0.21	3.9	ND	ND	ND
Caprolactam	µg/L	ND	ND	ND	ND	ND
Carbazole	µg/L	ND	ND	ND	ND	ND
Chrysene	µg/L	ND	ND	ND	ND	ND
Di-n-butyl phthalate	µg/L	0.25	0.23	ND	ND	ND
Di-n-octyl phthalate	µg/L	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	µg/L	ND	ND	ND	ND	ND
Dibenzofuran	µg/L	ND	ND	ND	ND	ND
Diethyl phthalate	µg/L	ND	ND	ND	ND	ND
Dimethyl phthalate	µg/L	ND	ND	ND	ND	ND
Fluoranthene	µg/L	0.022	0.028	ND	ND	0.019
Fluorene	µg/L	ND	ND	ND	ND	ND
Hexachlorobenzene	µg/L	ND	ND	ND	ND	ND
Hexachlorobutadiene	µg/L	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	µg/L	ND	ND	ND	ND	ND
Hexachloroethane	µg/L	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	µg/L	ND	ND	ND	ND	ND
Isophorone	µg/L	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	µg/L	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	µg/L	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	µg/L	ND	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	0.032	ND	ND
Nitrobenzene	µg/L	ND	ND	ND	ND	ND
Pentachlorophenol	µg/L	ND	ND	3	ND	ND
Phenanthrene	µg/L	0.072	0.13	0.052	0.042	0.058
Phenol	µg/L	ND	ND	ND	ND	ND
Pyrene	µg/L	ND	0.015	ND	ND	0.019

Table 2-18. (Continued)

Sample ID Lab Report ID		WIER0427 C0D280512003	WIER0504 C0E060542004	WEIR0506 C0E070494003	WIER0511 C0E120504003	WIER0517 C0E180492004
Sample Date		4/27/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010
Analyte	**Unit**					
1,1-Biphenyl	µg/L	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine	µg/L	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dichlorophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dimethylphenol	µg/L	ND	ND	ND	ND	ND
2,4-Dinitrophenol	µg/L	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND
2-Chloronaphthalene	µg/L	ND	ND	ND	ND	ND
2-Chlorophenol	µg/L	ND	ND	ND	ND	ND
2-Methylnaphthalene	µg/L	ND	ND	0.025	ND	ND
2-Methylphenol	µg/L	ND	ND	ND	ND	ND
2-Nitroaniline	µg/L	ND	ND	ND	ND	ND
2-Nitrophenol	µg/L	ND	ND	ND	ND	ND
3,3-Dichlorobenzidine	µg/L	ND	ND	ND	ND	ND
3-Nitroaniline	µg/L	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	µg/L	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	µg/L	ND	ND	ND	ND	ND
4-Chloroaniline	µg/L	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND
4-Methylphenol	µg/L	ND	ND	ND	ND	ND
4-Nitroaniline	µg/L	ND	ND	ND	ND	ND
4-Nitrophenol	µg/L	ND	ND	ND	ND	ND
Acetophenone	µg/L	ND	0.38	0.35	ND	0.39
Benzaldehyde	µg/L	0.6	ND	ND	0.82	0.61
Benzidine	µg/L	ND	ND	ND	ND	ND
Benzo(a)anthracene	µg/L	ND	ND	ND	0.028	ND
Benzo(a)pyrene	µg/L	ND	ND	ND	0.034	ND
Benzo(b)fluoranthene	µg/L	ND	ND	ND	ND	ND
Benzo(ghi)perylene	µg/L	ND	ND	ND	0.069	ND

Table 2-18. (Continued)

Sample ID Lab Report ID		WIER0427 C0D280512003	WIER0504 C0E060542004	WEIR0506 C0E070494003	WIER0511 C0E120504003	WIER0517 C0E180492004
Sample Date		4/27/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010
Analyte	**Unit**					
Benzo(k)fluoranthene	µg/L	ND	ND	ND	ND	ND
bis(2-Chloroethoxy)methane	µg/L	ND	ND	ND	ND	ND
bis(2-Chloroethyl) ether	µg/L	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl) ether	µg/L	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	µg/L	ND	ND	ND	ND	11
Butyl benzyl phthalate	µg/L	ND	ND	ND	0.36	0.69
Caprolactam	µg/L	ND	ND	ND	ND	3.7
Carbazole	µg/L	ND	ND	ND	ND	ND
Chrysene	µg/L	ND	ND	ND	0.034	ND
Di-n-butyl phthalate	µg/L	ND	ND	ND	0.13	0.19
Di-n-octyl phthalate	µg/L	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	µg/L	ND	ND	ND	0.088	ND
Dibenzofuran	µg/L	ND	ND	ND	ND	ND
Diethyl phthalate	µg/L	ND	ND	ND	0.15	0.31
Dimethyl phthalate	µg/L	ND	ND	ND	ND	ND
Fluoranthene	µg/L	ND	0.022	0.03	0.019	0.019
Fluorene	µg/L	ND	ND	0.02	ND	ND
Hexachlorobenzene	µg/L	ND	ND	ND	ND	ND
Hexachlorobutadiene	µg/L	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	µg/L	ND	ND	ND	ND	ND
Hexachloroethane	µg/L	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	µg/L	ND	ND	ND	0.067	ND
Isophorone	µg/L	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	µg/L	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	µg/L	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	µg/L	ND	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	ND	ND	ND
Nitrobenzene	µg/L	ND	ND	ND	ND	ND
Pentachlorophenol	µg/L	ND	ND	ND	ND	ND
Phenanthrene	µg/L	0.082	0.13	0.073	0.067	0.11
Phenol	µg/L	ND	ND	ND	ND	ND
Pyrene	µg/L	ND	ND	ND	0.018	0.016

Table 2-19. Killcohook Cell 3 Weir Semi-volatile Organic Data

Sample ID Lab Report ID		WIER0427 C0D280518003	WIER0429 C0D300570003	WIER0504 C0E060543003	WIER0506 C0E070562003	WIER0511 C0E120515002	WIER0517 C0E180515003
Sample Date		4/27/2010	4/29/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010
Analyte	**Unit**						
1,1-Biphenyl	µg/L	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine	µg/L	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	µg/L	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	µg/L	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	µg/L	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	µg/L	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	µg/L	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	µg/L	ND	ND	ND	ND	ND	ND
2-Chlorophenol	µg/L	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	µg/L	ND	ND	ND	ND	ND	ND
2-Methylphenol	µg/L	ND	ND	ND	ND	ND	ND
2-Nitroaniline	µg/L	ND	ND	ND	ND	ND	ND
2-Nitrophenol	µg/L	ND	ND	ND	ND	ND	ND
3,3-Dichlorobenzidine	µg/L	ND	ND	ND	ND	ND	ND
3-Nitroaniline	µg/L	ND	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	µg/L	ND	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	µg/L	ND	ND	ND	ND	ND	ND
4-Chloroaniline	µg/L	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND	ND
4-Methylphenol	µg/L	ND	ND	ND	ND	ND	ND
4-Nitroaniline	µg/L	ND	ND	ND	ND	ND	ND
4-Nitrophenol	µg/L	ND	ND	ND	ND	ND	ND
Acetophenone	µg/L	ND	ND	0.38	ND	ND	0.35
Benzaldehyde	µg/L	0.51	ND	0.72	0.57	ND	ND
Benzidine	µg/L	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	µg/L	ND	0.067	0.58	0.13	ND	ND
Benzo(a)pyrene	µg/L	ND	0.16	0.32	0.12	ND	ND
Benzo(b)fluoranthene	µg/L	ND	0.13	0.56	0.28	ND	ND
Benzo(ghi)perylene	µg/L	ND	0.44	0.59	0.4	ND	ND

Table 2-19. (Continued)

Sample ID Lab Report ID		WIER0427 C0D280518003	WIER0429 C0D300570003	WIER0504 C0E060543003	WIER0506 C0E070562003	WIER0511 C0E120515002	WIER0517 C0E180515003
Sample Date		4/27/2010	4/29/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010
Analyte	**Unit**						
Benzo(k)fluoranthene	µg/L	ND	0.29	0.63	0.31	ND	ND
bis(2-Chloroethoxy)methane	µg/L	ND	ND	ND	ND	ND	ND
bis(2-Chloroethyl) ether	µg/L	ND	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl) ether	µg/L	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	µg/L	ND	3.1	1.5	ND	ND	1.1
Butyl benzyl phthalate	µg/L	ND	0.28	0.28	ND	0.28	0.45
Caprolactam	µg/L	ND	ND	ND	ND	1.8	2.1
Carbazole	µg/L	ND	ND	0.026	ND	ND	ND
Chrysene	µg/L	ND	0.092	0.62	0.2	ND	ND
Di-n-butyl phthalate	µg/L	ND	ND	0.18	ND	0.18	ND
Di-n-octyl phthalate	µg/L	ND	ND	0.53	ND	ND	ND
Dibenz(a,h)anthracene	µg/L	ND	0.4	0.67	0.44	ND	ND
Dibenzofuran	µg/L	ND	ND	ND	ND	ND	ND
Diethyl phthalate	µg/L	ND	ND	0.76	ND	0.22	0.2
Dimethyl phthalate	µg/L	ND	ND	ND	ND	ND	ND
Fluoranthene	µg/L	ND	ND	0.15	ND	0.015	ND
Fluorene	µg/L	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	µg/L	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	µg/L	ND	ND	ND	ND	ND	ND
Hexachloroethane	µg/L	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	µg/L	ND	0.35	0.62	0.37	ND	ND
Isophorone	µg/L	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	µg/L	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	µg/L	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	µg/L	ND	ND	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	ND	ND	0.021	ND
Nitrobenzene	µg/L	ND	ND	ND	ND	ND	ND
Pentachlorophenol	µg/L	ND	ND	ND	ND	ND	ND
Phenanthrene	µg/L	0.071	ND	0.46	0.058	0.059	0.077
Phenol	µg/L	ND	ND	ND	ND	ND	0.17
Pyrene	µg/L	ND	ND	0.15	ND	ND	ND

Table 2-20. Killcohook Cell 2 Mix Semi-volatile Organic Data

Sample ID Lab Report ID		MIX0402 C0D060501001	MIX0406 C0D070526001	MIX0504 C0E060542001	MIX0506 C0E070494001	MIX0511 C0E120504001	MIX0517 C0E180492001
Sample Date		4/2/2010	4/6/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010
Analyte	**Unit**						
1,1-Biphenyl	µg/L	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine	µg/L	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	µg/L	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	µg/L	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	µg/L	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	µg/L	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	µg/L	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	µg/L	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	µg/L	ND	ND	ND	ND	ND	ND
2-Chlorophenol	µg/L	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	µg/L	0.012	0.026	0.049	0.024	ND	0.023
2-Methylphenol	µg/L	ND	ND	ND	ND	ND	ND
2-Nitroaniline	µg/L	ND	ND	ND	ND	ND	ND
2-Nitrophenol	µg/L	ND	ND	ND	ND	ND	ND
3,3-Dichlorobenzidine	µg/L	ND	ND	ND	ND	ND	ND
3-Nitroaniline	µg/L	ND	ND	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	µg/L	ND	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND	ND
4-Chloro-3-methylphenol	µg/L	ND	ND	ND	ND	ND	ND
4-Chloroaniline	µg/L	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	µg/L	ND	ND	ND	ND	ND	ND
4-Methylphenol	µg/L	ND	ND	ND	ND	ND	ND
4-Nitroaniline	µg/L	ND	ND	ND	ND	ND	ND
4-Nitrophenol	µg/L	ND	ND	ND	ND	ND	ND
Acenaphthene	µg/L	ND	0.023	ND	ND	ND	ND
Acenaphthylene	µg/L	ND	ND	ND	ND	ND	ND
Acetophenone	µg/L	ND	0.42	ND	ND	ND	0.41
Anthracene	µg/L	0.033	0.024	ND	ND	0.014	0.18
Atrazine	µg/L	ND	ND	ND	ND	ND	ND
Benzaldehyde	µg/L	0.8	0.69	0.62	0.62	0.81	0.65
Benzidine	µg/L	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	µg/L	0.099	ND	0.041	ND	ND	1.4
Benzo(a)pyrene	µg/L	0.091	ND	ND	ND	ND	0.86

Table 2-20. (Continued)

Sample ID Lab Report ID		MIX0402 C0D060501001	MIX0406 C0D070526001	MIX0504 C0E060542001	MIX0506 C0E070494001	MIX0511 C0E120504001	MIX0517 C0E180492001
Sample Date		4/2/2010	4/6/2010	5/4/2010	5/6/2010	5/11/2010	5/17/2010
Analyte	**Unit**						
Benzo(b)fluoranthene	µg/L	0.11	ND	ND	ND	ND	1.2
Benzo(ghi)perylene	µg/L	0.17	ND	ND	ND	ND	1.4
Benzo(k)fluoranthene	µg/L	0.18	ND	ND	ND	ND	1.5
bis(2-Chloroethoxy)methane	µg/L	ND	ND	ND	ND	ND	ND
bis(2-Chloroethyl) ether	µg/L	ND	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl) ether	µg/L	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	µg/L	ND	1	ND	ND	ND	1.1
Butyl benzyl phthalate	µg/L	0.19	ND	0.13	ND	0.23	0.5
Caprolactam	µg/L	ND	ND	ND	ND	1.7	3.3
Carbazole	µg/L	0.062	ND	ND	ND	0.024	0.037
Chrysene	µg/L	0.13	ND	0.028	ND	ND	1.5
Di-n-butyl phthalate	µg/L	ND	0.31	ND	ND	0.12	0.22
Di-n-octyl phthalate	µg/L	ND	ND	ND	ND	ND	0.37
Dibenz(a,h)anthracene	µg/L	0.16	ND	ND	ND	ND	1.6
Dibenzofuran	µg/L	ND	ND	ND	ND	ND	0.062
Diethyl phthalate	µg/L	ND	ND	ND	ND	0.17	0.38
Dimethyl phthalate	µg/L	ND	ND	ND	ND	ND	ND
Fluoranthene	µg/L	0.075	0.058	0.085	ND	0.037	0.36
Fluorene	µg/L	ND	0.03	0.032	ND	ND	0.048
Hexachlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	µg/L	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	µg/L	ND	ND	ND	ND	ND	ND
Hexachloroethane	µg/L	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	µg/L	0.16	ND	ND	ND	ND	1.4
Isophorone	µg/L	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	µg/L	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	µg/L	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	µg/L	ND	ND	ND	ND	ND	ND
Naphthalene	µg/L	ND	0.044	0.1	ND	ND	0.048
Nitrobenzene	µg/L	ND	ND	ND	ND	ND	ND
Pentachlorophenol	µg/L	ND	ND	ND	ND	ND	0.08
Phenanthrene	µg/L	0.094	0.12	0.13	0.071	0.08	0.22
Phenol	µg/L	ND	ND	ND	ND	ND	0.39
Pyrene	µg/L	0.073	0.052	0.062	0.023	0.028	0.29

Table 2-21. Killcohook Cell 3 Mix Semi-volatile Organic Data

Sample ID Lab Report ID		MIX0504 C0E060543001	MIX0506 C0E070562001	MIX0511 C0E120515001	MIX0517 C0E180515001
Sample Date		5/4/2010	5/6/2010	5/11/2010	5/17/2010
Analyte	Unit				
1,1-Biphenyl	µg/L	ND	ND	ND	ND
1,2,4-Trichlorobenzene	µg/L	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND
1,2-Diphenylhydrazine	µg/L	ND	ND	ND	ND
1,3-Dichlorobenzene	µg/L	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND
2,4,5-Trichlorophenol	µg/L	ND	ND	ND	ND
2,4,6-Trichlorophenol	µg/L	ND	ND	ND	ND
2,4-Dichlorophenol	µg/L	ND	ND	ND	ND
2,4-Dimethylphenol	µg/L	ND	ND	ND	ND
2,4-Dinitrophenol	µg/L	ND	ND	ND	ND
2,4-Dinitrotoluene	µg/L	ND	ND	ND	ND
2,6-Dinitrotoluene	µg/L	ND	ND	ND	ND
2-Chloronaphthalene	µg/L	ND	ND	ND	ND
2-Chlorophenol	µg/L	ND	ND	ND	ND
2-Methylnaphthalene	µg/L	ND	0.017	0.019	ND
2-Methylphenol	µg/L	ND	ND	ND	ND
2-Nitroaniline	µg/L	ND	ND	ND	ND
2-Nitrophenol	µg/L	ND	ND	ND	ND
3,3-Dichlorobenzidine	µg/L	ND	ND	ND	ND
3-Nitroaniline	µg/L	ND	ND	ND	ND
4,6-Dinitro-2-methylphenol	µg/L	ND	ND	ND	ND
4-Bromophenyl phenyl ether	µg/L	ND	ND	ND	ND
4-Chloro-3-methylphenol	µg/L	ND	ND	ND	ND
4-Chloroaniline	µg/L	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	µg/L	ND	ND	ND	ND
4-Methylphenol	µg/L	ND	ND	ND	ND
4-Nitroaniline	µg/L	ND	ND	ND	ND
4-Nitrophenol	µg/L	ND	ND	ND	ND
Acenaphthene	µg/L	ND	ND	ND	ND
Acenaphthylene	µg/L	ND	ND	ND	ND
Acetophenone	µg/L	ND	ND	ND	0.38
Anthracene	µg/L	ND	ND	ND	ND
Atrazine	µg/L	ND	ND	ND	ND
Benzaldehyde	µg/L	0.59	ND	0.8	0.59
Benzidine	µg/L	ND	ND	ND	ND
Benzo(a)anthracene	µg/L	ND	ND	0.067	ND
Benzo(a)pyrene	µg/L	ND	ND	0.11	ND
Benzo(b)fluoranthene	µg/L	ND	ND	ND	ND
Benzo(ghi)perylene	µg/L	ND	ND	0.26	ND

Table 2-21. (Continued)

Sample ID Lab Report ID		MIX0504 C0E060543001	MIX0506 C0E070562001	MIX0511 C0E120515001	MIX0517 C0E180515001
Sample Date		5/4/2010	5/6/2010	5/11/2010	5/17/2010
Analyte	Unit				
Benzo(k)fluoranthene	µg/L	ND	ND	0.26	ND
bis(2-Chloroethoxy)methane	µg/L	ND	ND	ND	ND
bis(2-Chloroethyl) ether	µg/L	ND	ND	ND	ND
bis(2-Chloroisopropyl) ether	µg/L	ND	ND	ND	ND
bis(2-Ethylhexyl) phthalate	µg/L	ND	ND	ND	ND
Butyl benzyl phthalate	µg/L	ND	ND	0.27	0.13
Caprolactam	µg/L	ND	ND	ND	3.5
Carbazole	µg/L	ND	ND	ND	ND
Chrysene	µg/L	ND	ND	0.11	ND
Di-n-butyl phthalate	µg/L	ND	ND	0.12	ND
Di-n-octyl phthalate	µg/L	ND	ND	ND	ND
Dibenz(a,h)anthracene	µg/L	ND	ND	0.29	ND
Dibenzofuran	µg/L	ND	ND	ND	ND
Diethyl phthalate	µg/L	ND	ND	0.15	ND
Dimethyl phthalate	µg/L	ND	ND	ND	ND
Fluoranthene	µg/L	0.046	0.042	0.04	0.026
Fluorene	µg/L	ND	ND	ND	0.021
Hexachlorobenzene	µg/L	ND	ND	ND	ND
Hexachlorobutadiene	µg/L	ND	ND	ND	ND
Hexachlorocyclopentadiene	µg/L	ND	ND	ND	ND
Hexachloroethane	µg/L	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	µg/L	ND	ND	0.2	ND
Isophorone	µg/L	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	µg/L	ND	ND	ND	ND
N-Nitrosodimethylamine	µg/L	ND	ND	ND	ND
N-Nitrosodiphenylamine	µg/L	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	0.041	0.03
Nitrobenzene	µg/L	ND	ND	ND	ND
Pentachlorophenol	µg/L	ND	ND	ND	ND
Phenanthrene	µg/L	0.095	0.082	0.09	0.11
Phenol	µg/L	ND	ND	ND	ND
Pyrene	µg/L	0.034	0.027	0.039	0.029

2.3 TOTAL SUSPENDED SEDIMENT

Tables 2-22 through 2-26 present total suspended sediment (TSS) data for the weir discharge of cells 2 and 3, the Delaware River mix samples for cells 2 and 3 and background. As can be seen from Table 2-23 (cell 2 weir discharge) and Table 2-24 (cell 3 weir discharge), the dredged material containment cells are very efficient at retaining sediment. The highest concentration of TSS detected at either weir was at cell 2 on March 30, 2010. On that day the TSS concentration was 210 mg/L, or less than a quarter of a gram of sediment per liter of water which was lower than the maximum background concentration. This level of TSS indicates that both cells and discharge weirs are working in optimum fashion (Figures 2-1 and 2-2). Mix zone samples taken along the Delaware River shore line where the CDFs discharged into the river had much higher TSS levels than weir or back ground samples. This was largely due to the shallow nature of the shoreline at Killcohook where wind and vessel induced wave action increased the TSS levels along the entire shoreline (Figure 2-2).

Table 2-22. Killcohook Background Total Suspended Solids Data

Sample ID	Lab Report ID	Date Collected	TSS (mg/L)
BG0318	C0C190563002	3/18/2010	15.2
BG0324	C0C250605001	3/24/2010	291
BG0402	C0D060501002	4/2/2010	14.4
BG0406	C0D070526002	4/6/2010	34
BG0504	C0E060542002	5/4/2010	91
BG0511	C0E120504002	5/11/2010	37.6
BG0517	C0E180492002	5/17/2010	16

Table 2-23. Killcohook Cell 2 Weir Total Suspended Solids Data

Sample ID	Lab Report ID	Date Collected	TSS (mg/L)	Sample ID	Lab Report ID	Date Collected	TSS (mg/L)
WIER0311	C0C190563003	3/11/2010	33.2	WIER0418	C0D200485003	4/18/2010	67.2
WIER0312	C0C190563004	3/12/2010	42.8	WIER0419	C0D200485008	4/19/2010	48
WIER0313	C0C190563005	3/13/2010	66.4	WIER0420	C0D230554004	4/20/2010	88
WIER0314	C0C190563006	3/14/2010	25.2	WIER0421	C0D230554003	4/21/2010	174
WIER0318	C0C230507004	3/18/2010	46.4	WIER0422	C0D280512008	4/22/2010	122
WIER0319	C0C230507003	3/19/2010	66	WIER0423	C0D280512007	4/23/2010	49.3
WIER0322	C0C250605004	3/22/2010	120	WIER0424	C0D280512006	4/24/2010	39.2
WIER0324	C0C300513007	3/24/2010	75	WIER0425	C0D280512005	4/25/2010	36.4
WIER0326	C0C300513006	3/26/2010	101	WIER0426	C0D280512004	4/26/2010	50.7
WIER0327	C0C300513005	3/27/2010	72	WIER0429	C0E060542009	4/29/2010	3
WIER0328	C0C300513004	3/28/2010	188	WIER0430	C0E060542008	4/30/2010	43
WIER0329	C0D060501008	3/29/2010	169	WIER0501	C0E060542007	5/1/2010	9
WIER0330	C0D060501007	3/30/2010	210	WIER0502	C0E060542006	5/2/2010	<4.0
WIER0331	C0D060501006	3/31/2010	143	WIER0503	C0E060542005	5/3/2010	4
WIER0401	C0D060501005	4/1/2010	152	WEIR0504	C0E070494005	5/4/2010	36
WIER0402	C0D070526008	4/2/2010	204	WEIR0505	C0E070494004	5/5/2010	51.2
WIER0403	C0D070526007	4/3/2010	186	WIER0506	C0E120504009	5/6/2010	45.6
WIER0404	C0D070526006	4/4/2010	94	WIER0507	C0E120504008	5/7/2010	52.4
WIER0405	C0D070526005	4/5/2010	143	WIER0508	C0E120504007	5/8/2010	24
WIER0406	C0D090487005	4/6/2010	91	WIER0509	C0E120504006	5/9/2010	8.4
WIER0407	C0D090487004	4/7/2010	78	WIER0510	C0E120504005	5/10/2010	14
WIER0414	C0D200485007	4/14/2010	50.4	WIER0513	C0E180492008	5/13/2010	26
WIER0415	C0D200485006	4/15/2010	63.6	WIER0514	C0E180492007	5/14/2010	13
WIER0416	C0D200485005	4/16/2010	83.2	WIER0515	C0E180492006	5/15/2010	10
WIER0417	C0D200485004	4/17/2010	44.8	WIER0516	C0E180492005	5/16/2010	35

Table 2-24. Killcohook Cell 3 Weir Total Suspended Solids Data

Sample ID	Lab Report ID	Date Collected	TSS (mg/L)
WIER0422	C0D280518008	4/22/2010	26
WIER0423	C0D280518007	4/23/2010	45.2
WIER0424	C0D280518006	4/24/2010	12.8
WIER0425	C0D280518005	4/25/2010	16.4
WIER0426	C0D280518004	4/26/2010	24
WIER0427	C0D300570005	4/27/2010	10
WIER0428	C0D300570004	4/28/2010	19
WIER0429	C0E060543008	4/29/2010	10
WIER0430	C0E060543007	4/30/2010	18
WIER0501	C0E060543006	5/1/2010	19
WIER0502	C0E060543005	5/2/2010	20
WIER0503	C0E060543004	5/3/2010	28
WIER0504	C0E070562005	5/4/2010	24.4
WIER0505	C0E070562004	5/5/2010	39.6
WIER0506	C0E120515008	5/6/2010	28.8
WIER0507	C0E120515007	5/7/2010	25.6
WIER0508	C0E120515006	5/8/2010	27.6
WIER0509	C0E120515005	5/9/2010	30.8
WIER0510	C0E120515004	5/10/2010	20.8
WIER0514	C0E180515006	5/14/2010	6
WIER0515	C0E180515005	5/15/2010	9
WIER0516	C0E180515004	5/16/2010	59

Table 2-25. Killcohook Cell 2 Mix Total Suspended Solids Data.

Sample ID	Lab Report ID	Date Collected	TSS (mg/L)
MIX0318	C0C190563001	3/18/2010	94
MIX0322	C0C230507001	3/22/2010	347
MIX0324	C0C250605002	3/24/2010	319
MIX0329	C0C300513001	3/29/2010	79.6
MIX0402	C0D060501001	4/2/2010	106
MIX0406	C0D070526001	4/6/2010	334
MIX0408	C0D090487001	4/8/2010	388
MIX0419	C0D200485001	4/19/2010	432
MIX0427	C0D280512001	4/27/2010	499
MIX0504	C0E060542001	5/4/2010	1060
MIX0506	C0E070494001	5/6/2010	988
MIX0511	C0E120504001	5/11/2010	63.2
MIX0517	C0E180492001	5/17/2010	284

Table 2-26. Killcohook Cell 3 Mix Total Suspended Solids Data.

Sample ID	Lab Report ID	Date Collected	TSS (mg/L)
MIX0427	C0D280518001	4/27/2010	76.4
MIX0429	C0D300570001	4/29/2010	258
MIX0504	C0E060543001	5/4/2010	220
MIX0506	C0E070562001	5/6/2010	207
MIX0511	C0E120515001	5/11/2010	357
MIX0517	C0E180515001	5/17/2010	51

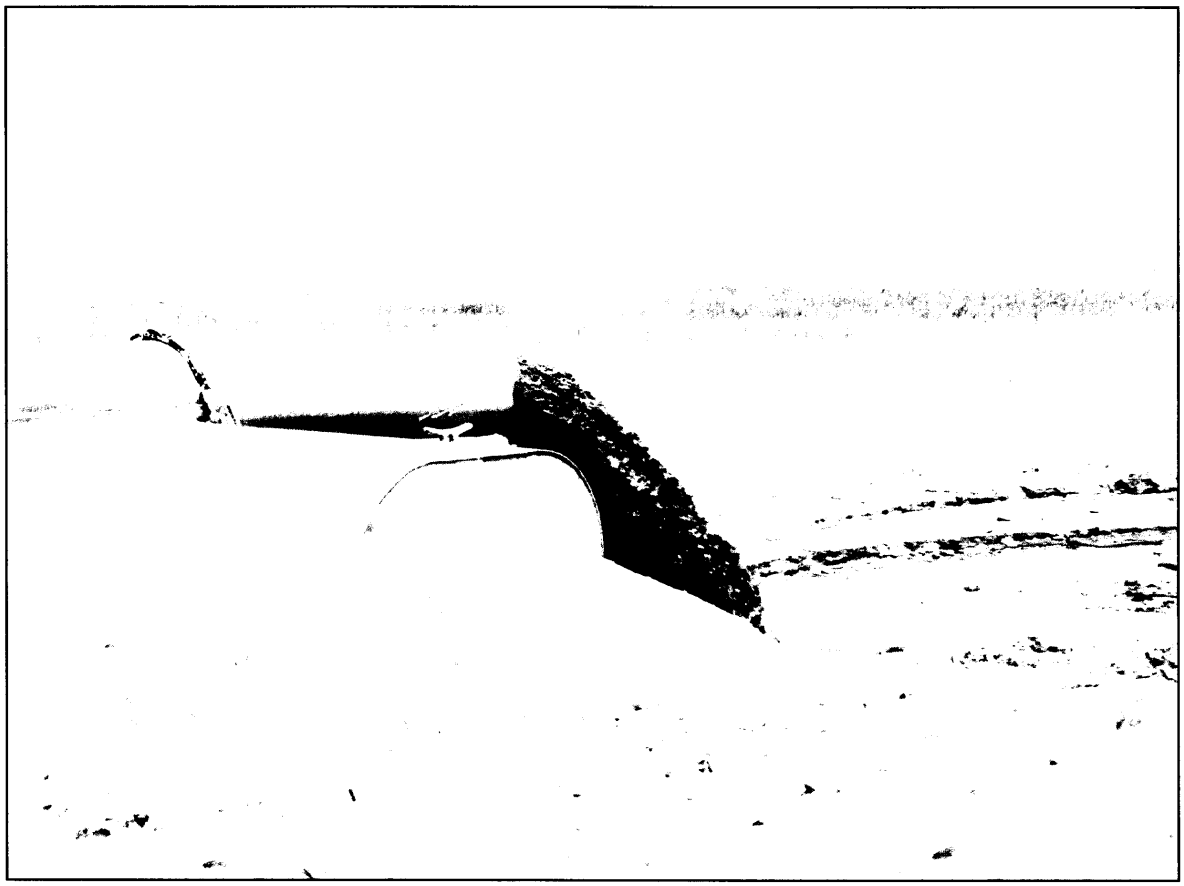


Figure 2-1. Dredge slurry being pumped into the Killcohook CDF during Reach C Deepening in the spring of 2010

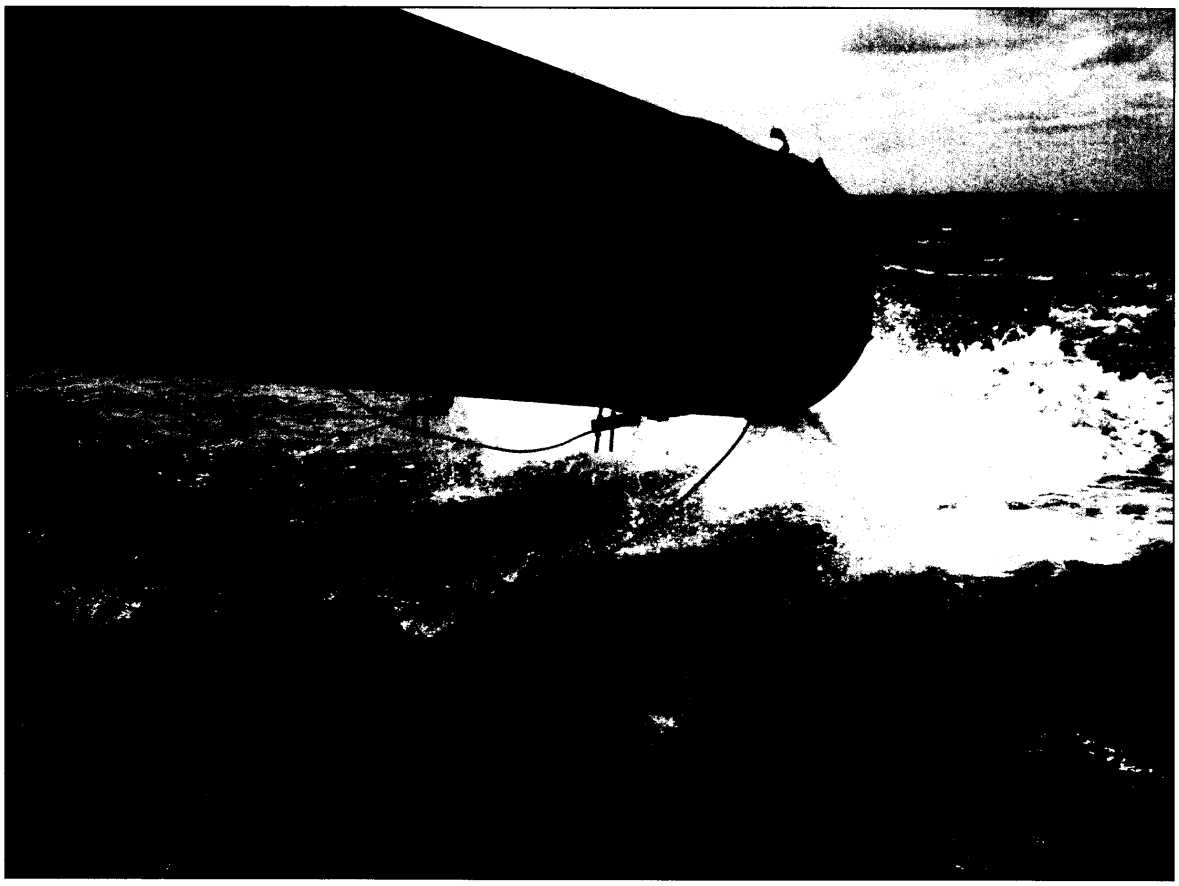


Figure 2-2. Killcohook Cell 2 weir discharge during Reach C Deepening in the spring of 2010

3.0 POINT OF DREDGE MONITORING

Water quality monitoring was conducted during dredging operations in Reach C to evaluate contaminant releases at the cutterhead and to correlate turbidity measured in Nephelometer Units (NTUs) to Total Suspended Solids (TSS). Previous turbidity plume studies by USACE and subsequent reviews by DNREC established that if TSS levels are kept below 250 mg/L 200 feet from the point of dredging then Delaware River water quality will be maintained. However, real time measurements for turbidity can only be accomplished with a turbidity meter that records NTUs. Turbidity is an optical measurement of light attenuation caused by particles in the water column. To convert NTUs into TSS site specific water sampling and simultaneous NTU measurements are needed to develop a regression equation to accurately convert on-site turbidity into TSS. Once a regression equation is created with sufficient replication at various levels of TSS, real time monitoring of turbidity can be employed during dredging operations to assure that TSS levels stay within water quality goals.

3.1 FIELD METHODS

For this interim report TSS and water samples for contaminant testing were conducted off the dredge Pullen (Figure 3-1) in four specific events. All four sampling events included simultaneous TSS and turbidity measurements while events 2 and 4 also included water sampling for contaminants (Table 3-1). Event 4 sampling for contaminants was conducted on 5/20/2010 but the laboratory analyses were not available for this interim report.

Table 3-1. Point of Dredge sampling dates and parameters sampled in 4 of the 7 scheduled monitoring events for Reach C deepening

Date	Event Number	TSS	NTU	Water Column Contaminants
3/16-17/2010	1	X	X	
4/1/2010	2	X	X	X
4/30/2010	3	X	X	
5/20/2010	4	X	X	X*

* Samples collected but laboratory data were not available

For each sampling event two rounds of sampling was conducted during flood tide from Versar's sampling vessel moored onto the starboard side of the Pullen dredge approximately 200 feet downstream of where the cutterhead contacted the river bottom (Figure 3-2). All dredging operations on the Pullen are being conducted with the cutterhead pointing downriver. Therefore only flood tide water sampling was conducted to insure that data were taken down current of the working hydraulic cutterhead. For logistical reasons (e.g., the dredge's side to side swinging) and safety concerns (e.g., presence of pipelines, anchor chain, high currents, and mobile workboats) sampling could only be conducted while moored to the dredge boat.

Turbidity and TSS samples were taken at 0.5, 6, and 11-meter depths while water samples for contaminant testing were only taken at the 6 and 11-meter increments. Using a data logging YSI 6600 water quality meter turbidity, temperature, salinity, dissolved oxygen, and pH were recorded every 2 seconds at each of three depths for at total of 15 minutes during active dredging. Because the dredge barge swings in a 400 foot arch while dredging, the swing position was recorded on field sheets every minute during the data logging. Slightly starboard of the center position sampling was more likely to be in the turbidity plume created at the cutterhead while the extreme starboard and port positions would be out of the plume 200 feet from the cutter head. Dredge boat swing position and swing rate varied according to bottom hardness, depth of cut, and ambient depth and other conditions deemed necessary by the captain who operated independently of the environmental sampling team.

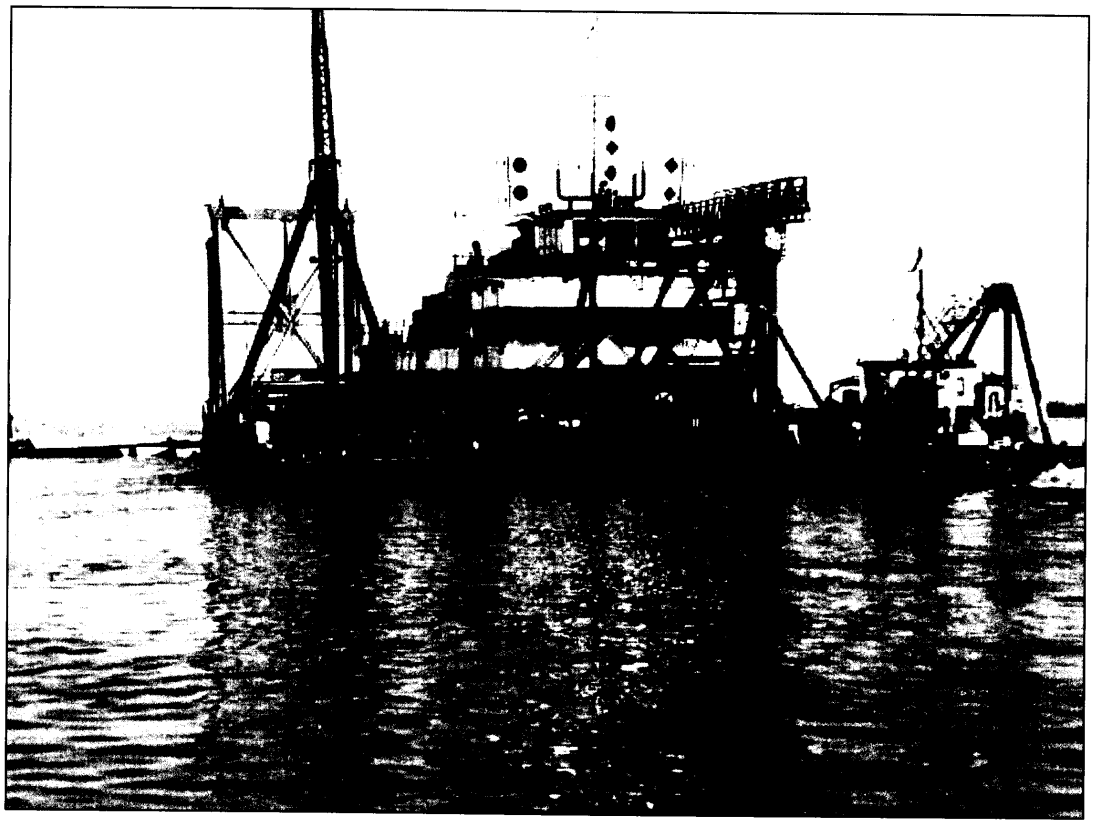


Figure 3-1. Pullen dredge boat working in Reach C of the Delaware River in spring 2010

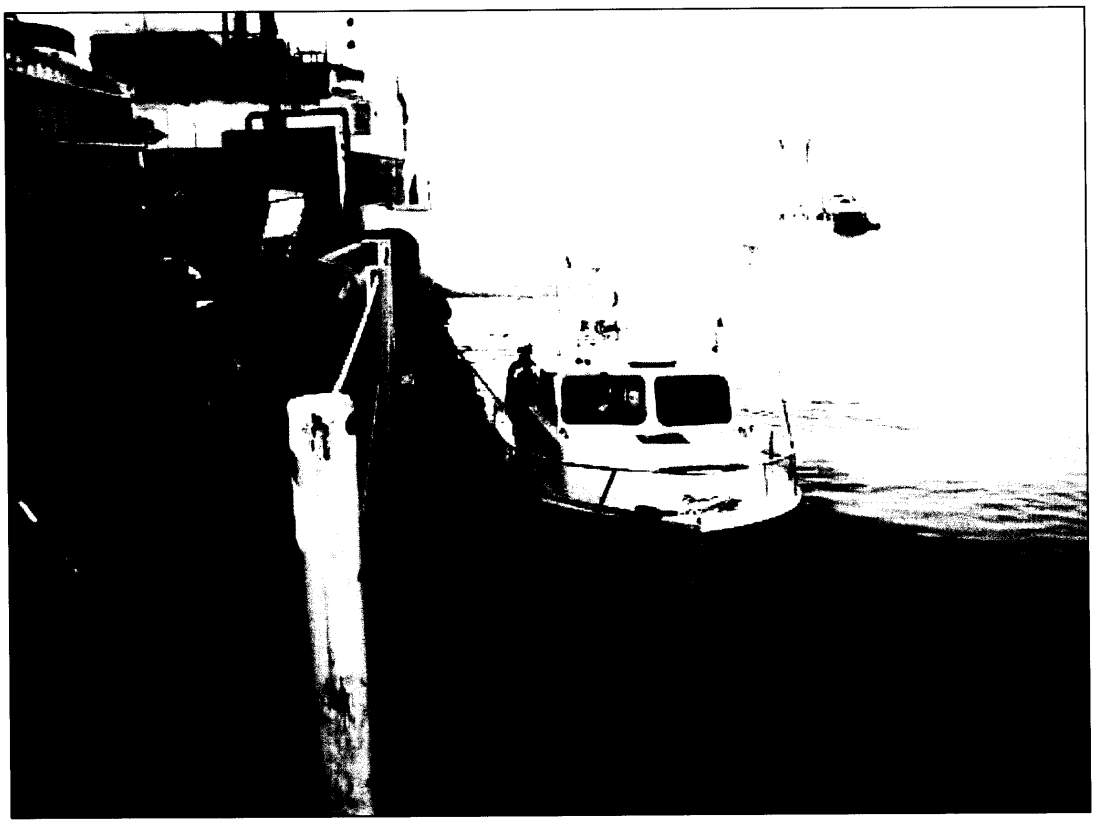


Figure 3-2. Versar sampling vessel, RV Integrity, moored along the starboard side of the Pullen dredge approximately 200 feet from where the cutterhead contacted the river bottom

The YSI meter was attached horizontally to a Wildco® opening and closing sample bottle (Figure 3-3). After 15 minutes of data logging at depth three water samples for TSS measurements were taken by sending a weighted tripping mechanism down the cable to close the bottle. The field NTU on the YSI hand held display was recorded when the bottle tripped shut. TSS samples were taken at port, center, and starboard swing positions whenever possible. Water samples for contaminant testing were taken during Event 2 (two rounds of collections) using a peristaltic pump and a Teflon® hose attached to the closing sample bottle. Upriver and downriver background samples were taken approximately 1/2 mile away from the dredge boat for each sampling event. A data logging water quality cast from surface to 11-meters was taken along with TSS and contaminant sampling at 0.5, 6 and 11-meter depths similar to the collection taken while moored to the Pullen. Only one round of background samples was taken per event. To characterize the grain size of the dredged material sediment samples were taken in front to the cutterhead with a ponar grab. During Event 2 water sampling for contaminants, the ponar grab was decontaminated with an alconox wash, an acetone rinse, and a final deionized water rinse before obtaining sediment samples for bulk sediment testing.

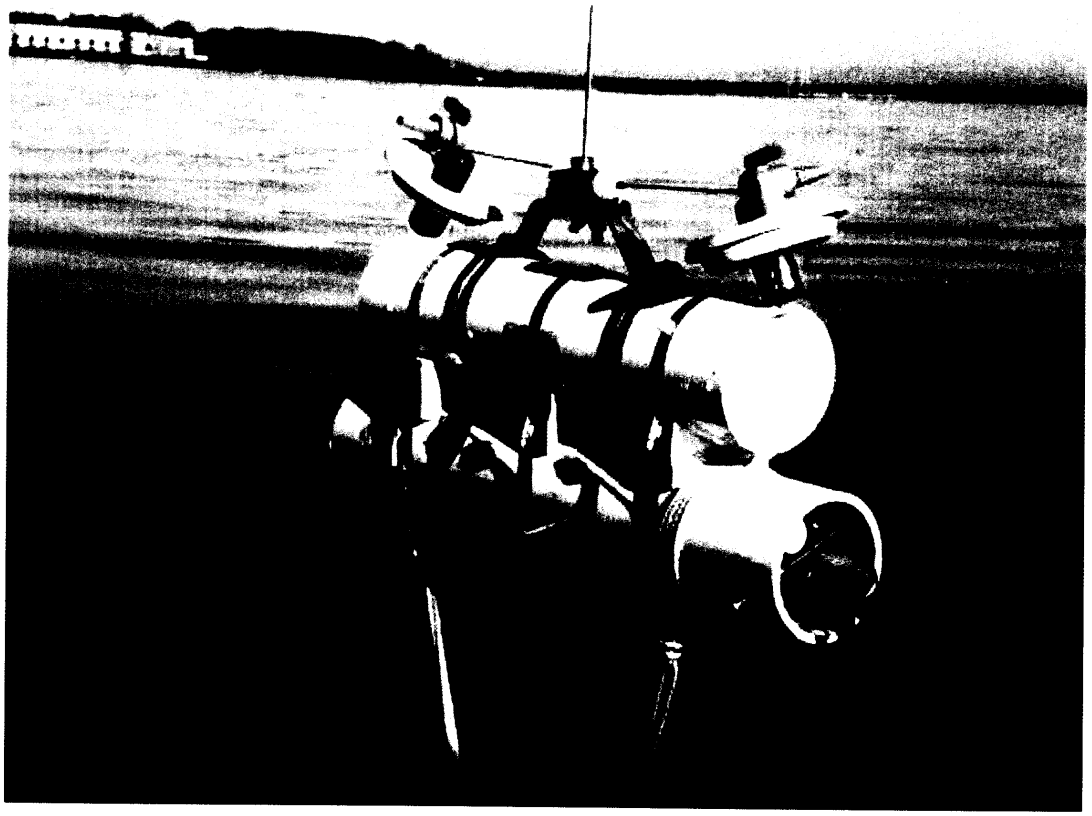


Figure 3-3. YSI water quality meter attached to open sample bottle for the Point of Dredge TSS and turbidity testing in Reach C of the Delaware River Deepening project

All water and sediment samples were labeled and shipped on ice to Test America laboratories in Pittsburgh, PA for analysis. TSS samples were processed the next day in Versar's sediment laboratory in Columbia, MD. Contaminant testing included Pesticides, PCBs (as Aroclors and congener-specific), dioxins and furans, semi-volatile organics, metals and inorganics, and dissolved and particulate organic carbon. Only the 11-meter depth water samples and the bulk sediment sample taken in Event 2 were tested for high resolution congener specific PCBs and dioxins and furans.

The field measurements of turbidity (NTUs) fluctuated in real time due to the flow by of particles making the exact turbidity at the time the Wildco® bottle closed subject to some uncertainty. Therefore turbidity was re-measured in the laboratory using the same YSI meter just before filtering the water through the filter pad for the TSS analysis. Regression analysis was run on both field and laboratory NTUs against the sample specific gravimetric measurement of TSS.

3.2 RESULTS

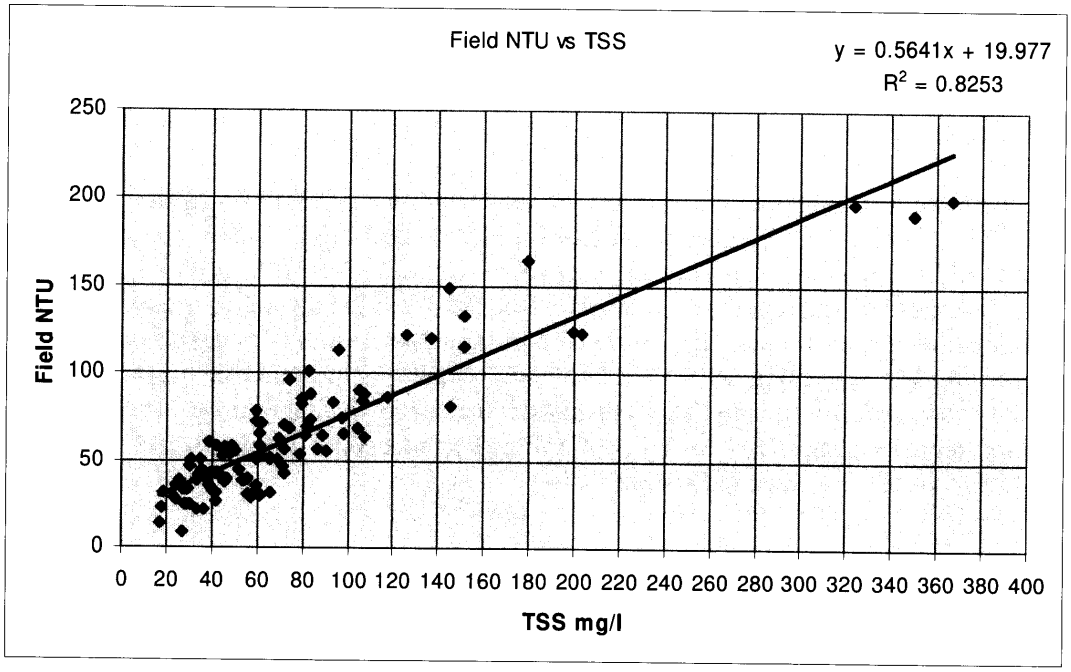
3.2.1 Turbidity

Among the four sampling events for TSS and turbidity a total of 104 paired samples were collected. The highest TSS concentration measured was 367 mg/L with a corresponding lab NTU of 228 while the lowest values in the data series was a TSS of 17 mg/L and a lab NTU of 27. Figure 3-4 presents the regression analysis of the field and lab turbidity, respectively. In the controlled laboratory environment the lab NTU regression had a slightly better R^2 of 0.88 relative to the field turbidity regression with an R^2 of 0.83. Table 3-2 presents the expected turbidity value that corresponds to various TSS concentrations using the laboratory based regression. Based on the regression, turbidity readings of 168 or less meets the 250 mg/l TSS water quality goal 200 feet from the hydraulic cutterhead.

Table 3-2. Expected NTUs at various mg/l TSS using lab based regression equation; ($y = 0.5715x + 24.878$)

y (NTU)	x (TSS)
167.8	250
139.2	200
110.6	150
82.0	100
53.5	50

Among the four point of dredge sampling events over 16,000 measurements of turbidity were logged at 0.5, 6 and 11 meter depth increments during active dredging. These data were binned into 5 NTU categories from 0 to 300 NTUs (for a total of 60 bins) and the frequency of occurrence in each category calculated for each depth increment (Figure 3-5). At the point of dredging essentially no values over 168 NTUs were observed at the surface during active dredging and only a small percentage of the 6 and 11 meter observations were over 168 NTUs. Background measurements logged during a slowly descending surface to 11 meter cast had a similar turbidity pattern to that observed at the 11-m depth increment 200 feet behind the working cutterhead. Eighteen percent of the background turbidity measurements were higher than 168 NTUs (primarily recorded from the lower depths), while 12% of the 11-m and 4% of the 6-m turbidity values were over this benchmark.



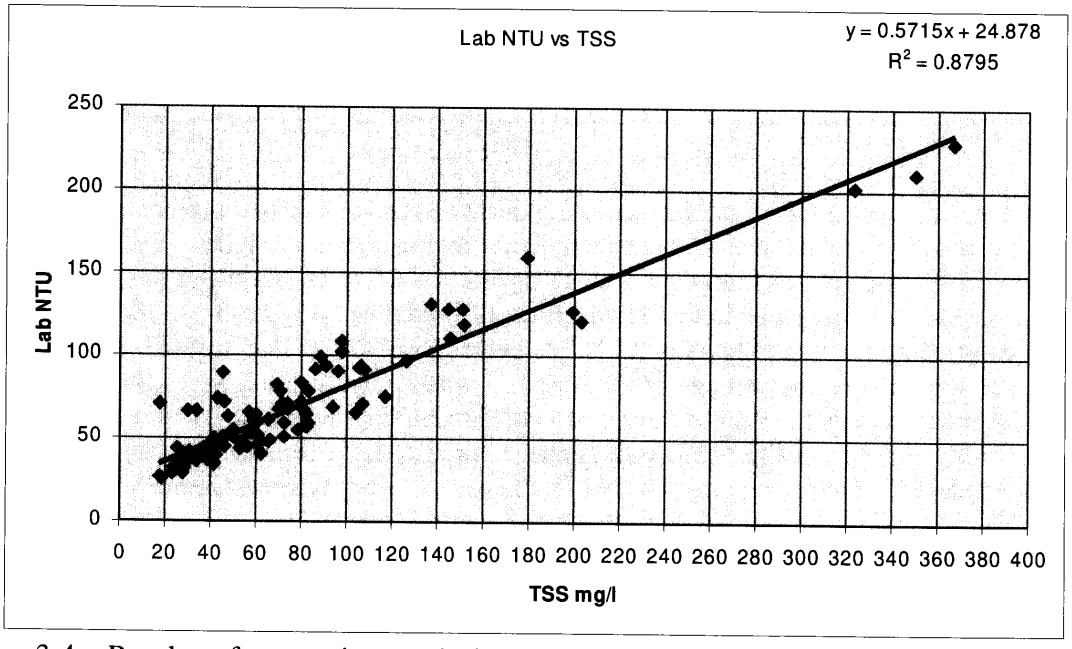


Figure 3-4. Results of regression analysis of field and laboratory turbidity measurements relative to TSS concentrations for samples collected on and around the Pullen dredge boat in the spring of 2010

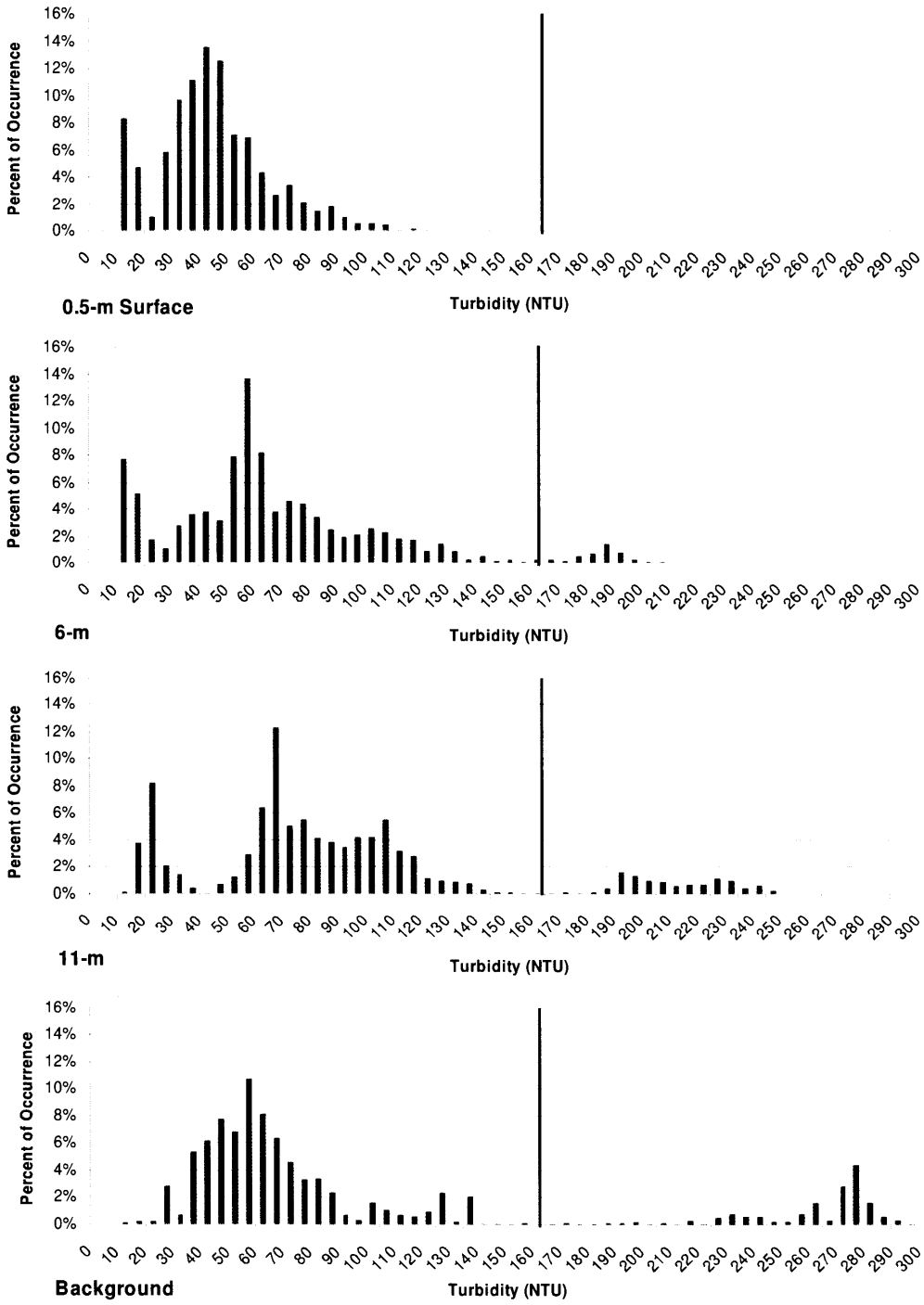


Figure 3-5. Frequency distribution of turbidity measurements in 5 NTU increments observed at 0.5, 6, and 11 meter depths 200 feet down current of the working cutterhead and at upriver and downriver background stations monitored in Reach C during spring 2010.

3.2.2 Contaminants

Contaminant samples collected during Event 2 (both Round 1 and 2) at the 6 and 11 meter depth increments suggest that water quality behind the working dredge was maintained. Tables 3-3 through 3-16 present the Pesticides/PCBs, semi-volatile organics, total metals, dissolved metals for the 11-m, 6-m and background samples. With the exception of total Aluminum, none of the inorganic parameters were measured in concentrations above their respective acute and chronic criteria for both DNREC and DRBC published water quality criteria. Although total aluminum concentrations at the 11 meter sample depth was over the acute criteria (Table 3-5), the observed concentrations were within the range reported for the upriver and downriver background samples (Table 3-13). The DDT pesticide breakdown byproducts DDE and DDD were slightly over the chronic criteria of 0.001 μg/L in the point of dredge 11 meter sample for Round 2 (Table 3-3), but similar concentrations for DDE over the chronic criteria were observed in the background 11 meter samples (Table 3-11). All other pesticides and semi-volatile organics were either not detected or below existing water quality criteria. Contaminant sampling at the 6 meter depth increment also resulted in total aluminum concentrations over acute criteria (Table 3-9) but again concentrations near the point of dredging was in the same range as the background samples (Table 3-13). Pesticides and semi-volatile organics at the 6 meter depth increment were either not detected or below existing water quality criteria (Tables 3-7 and 3-8).

Congener-specific high resolution PCB analyses were conducted on the 11- meter point of dredge Round 1 and 2 samples and the 11 meter upriver and downriver background samples. The sum of congeners was orders of magnitude below DNREC and DRBC acute and chronic water quality for total PCBs (Table 3-15). While there are no water quality criteria established for dioxin and furans for the Delaware River, the sum of homologs suggests point of dredge concentrations were in a similar range to those observed in the background samples (Table 3-16).

Table 3-3. Point of Dredge 11-m Pesticide and PCB Aroclor Data

Sample ID		C-11m (EVENT 2 ROUND 1)	C-11m (EVENT 2 ROUND 2)	DNREC	DNREC	DRBC	DRBC
Lab Report ID		**C0D060501013**	**C0D060501015**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010				
GCSEMI							
4,4-DDD	µg/L	ND	**0.0013**	1.1	**0.001**	0.55	**0.001**
4,4-DDE	µg/L	**0.0014**	**0.0016**	1.1	**0.001**	0.55	**0.001**
4,4-DDT	µg/L	ND	ND	1.1	0.001	0.55	0.001
Aldrin	µg/L	ND	ND	3.0	none	1.5	none
alpha-BHC	µg/L	ND	ND				
alpha-Chlordane	µg/L	ND	ND				
Aroclor 1016	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1221	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1232	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1242	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1248	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1254	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1260	µg/L	ND	ND	none	0.014	1.0	0.014
beta-BHC	µg/L	ND	ND				
Chlordane (technical)	µg/L	ND	ND	2.4	0.0043	1.2	0.0043
Chlorpyrifos	µg/L	ND	ND	0.083	0.041	0.083	0.041
delta-BHC	µg/L	ND	ND				
Dieldrin	µg/L	0.0012	0.0015	0.24	0.056	1.25	0.0019
Endosulfan I	µg/L	ND	ND	0.22	0.056	0.11	0.056
Endosulfan II	µg/L	ND	ND	0.22	0.056	0.11	0.056
Endosulfan sulfate	µg/L	ND	ND				
Endrin	µg/L	ND	ND	0.086	0.036	0.09	0.0023
Endrin aldehyde	µg/L	ND	ND				
Endrin ketone	µg/L	ND	ND				
gamma-BHC (Lindane)	µg/L	ND	0.0035	none	none	1.0	0.08
gamma-Chlordane	µg/L	ND	ND				
Heptachlor	µg/L	0.0022	0.0022	0.52	0.0038	0.26	0.0038
Heptachlor epoxide	µg/L	ND	ND				
Methoxychlor	µg/L	ND	ND	none	0.03	none	none
Parathion	µg/L	ND	ND	0.065	0.013	0.065	0.013
Toxaphene	µg/L	ND	ND	0.73	0.0002	0.73	0.0002

Table 3-4. Point of Dredge 11-m Semi-volatile Data

Sample ID		C-11m (EVENT 2 ROUND 1)	C-11m (EVENT 2 ROUND 2)	DNREC	DNREC	DRBC	DRBC
Lab Report ID		C0D060501013	C0D060501015	Acute	Chronic	Acute	Chronic
Sample Date		4/1/2010	4/1/2010				
MSSEMI							
1,1-Biphenyl	µg/L	ND	ND				
1,2,4-Trichlorobenzene	µg/L	ND	ND				
1,2-Dichlorobenzene	µg/L	ND	ND				
1,2-Diphenylhydrazine	µg/L	ND	ND				
1,3-Dichlorobenzene	µg/L	ND	ND				
1,4-Dichlorobenzene	µg/L	ND	ND				
2,4,5-Trichlorophenol	µg/L	ND	ND				
2,4,6-Trichlorophenol	µg/L	ND	ND				
2,4-Dichlorophenol	µg/L	ND	ND				
2,4-Dimethylphenol	µg/L	ND	ND				
2,4-Dinitrophenol	µg/L	ND	ND				
2,4-Dinitrotoluene	µg/L	ND	ND				
2,6-Dinitrotoluene	µg/L	ND	ND				
2-Chloronaphthalene	µg/L	ND	ND				
2-Chlorophenol	µg/L	ND	ND				
2-Methylnaphthalene	µg/L	ND	0.013				
2-Methylphenol	µg/L	ND	ND				
2-Nitroaniline	µg/L	ND	ND				
2-Nitrophenol	µg/L	ND	ND				
3,3-Dichlorobenzidine	µg/L	ND	ND				
3-Nitroaniline	µg/L	ND	ND				
4,6-Dinitro-2-methylphenol	µg/L	ND	ND				
4-Bromophenyl phenyl ether	µg/L	ND	ND				
4-Chloro-3-methylphenol	µg/L	ND	ND				
4-Chloroaniline	µg/L	ND	ND				
4-Chlorophenyl phenyl ether	µg/L	ND	ND				
4-Methylphenol	µg/L	ND	ND				
4-Nitroaniline	µg/L	ND	ND				
4-Nitrophenol	µg/L	ND	ND				
Acenaphthene	µg/L	ND	ND				
Acenaphthylene	µg/L	ND	ND				
Acetophenone	µg/L	ND	ND				
Anthracene	µg/L	ND	ND				
Atrazine	µg/L	ND	ND				
Benzaldehyde	µg/L	ND	0.89				
Benzidine	µg/L	ND	ND				
Benzo(a)anthracene	µg/L	ND	ND				

Table 3-4. (Continued)

Sample ID		C-11m (EVENT 2 ROUND 1)	C-11m (EVENT 2 ROUND 2)	DNREC	DNREC	DRBC	DRBC
Lab Report ID		**C0D060501013**	**C0D060501015**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010				
Benzo(a)pyrene	µg/L	ND	ND				
Benzo(b)fluoranthene	µg/L	ND	ND				
Benzo(ghi)perylene	µg/L	ND	ND				
Benzo(k)fluoranthene	µg/L	ND	ND				
bis(2-Chloroethoxy)methane	µg/L	ND	ND				
bis(2-Chloroethyl) ether	µg/L	ND	ND				
bis(2-Chloroisopropyl) ether	µg/L	ND	ND				
bis(2-Ethylhexyl) phthalate	µg/L	ND	ND				
Butyl benzyl phthalate	µg/L	0.7	0.63				
Caprolactam	µg/L	ND	ND				
Carbazole	µg/L	ND	ND				
Chrysene	µg/L	ND	ND				
Di-n-butyl phthalate	µg/L	ND	0.12				
Di-n-octyl phthalate	µg/L	ND	ND				
Dibenz(a,h)anthracene	µg/L	ND	ND				
Dibenzofuran	µg/L	ND	ND				
Diethyl phthalate	µg/L	ND	ND				
Dimethyl phthalate	µg/L	ND	ND				
Fluoranthene	µg/L	0.041	0.031				
Fluorene	µg/L	ND	ND				
Hexachlorobenzene	µg/L	ND	ND				
Hexachlorobutadiene	µg/L	ND	ND				
Hexachlorocyclopentadiene	µg/L	ND	ND				
Hexachloroethane	µg/L	ND	ND				
Indeno(1,2,3-cd)pyrene	µg/L	ND	ND				
Isophorone	µg/L	ND	ND				
N-Nitrosodi-n-propylamine	µg/L	ND	ND				
N-Nitrosodimethylamine	µg/L	ND	ND				
N-Nitrosodiphenylamine	µg/L	ND	ND				
Naphthalene	µg/L	ND	ND				
Nitrobenzene	µg/L	ND	ND				
Pentachlorophenol	µg/L	ND	ND	8.72	6.69	9.07	5.73
Phenanthrene	µg/L	0.082	0.099				
Phenol	µg/L	ND	ND				
Pyrene	µg/L	0.035	ND				

Table 3-5. Point of Dredge 11-m Total Metals Data

Sample ID		C-11m (EVENT 2 ROUND 1)	C-11m (EVENT 2 ROUND 2)	DNREC	DNREC	DRBC	DRBC
Lab Report ID		**C0D060501013**	**C0D060501015**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010				
MET							
Aluminum	µg/L	**2280**	**3660**	750	**87**	750	**87**
Antimony	µg/L	0.38	0.42				
Arsenic	µg/L	1.6	2.5	340	150	360	190
Barium	µg/L	36	44.5				
Beryllium	µg/L	0.14	0.24				
Cadmium	µg/L	ND	ND				
Calcium	µg/L	11700	12500				
Chromium	µg/L	10.1	14				
Cobalt	µg/L	1.6	2.5				
Copper	µg/L	5.7	7.8				
Cyanide, Total	µg/L	ND	ND	22	5.2	22	5.2
Iron	µg/L	3530	5600				
Lead	µg/L	5.5	8.1				
Magnesium	µg/L	3970	4890				
Manganese	µg/L	188	272				
Mercury	µg/L	2.1	6.6	1400	77	2400	12
Nickel	µg/L	3.3	4.8				
Potassium	µg/L	2100	2550				
Selenium	µg/L	0.81	0.83	20	5.0	20	5.0
Silver	µg/L	ND	0.053				
Sodium	µg/L	13500	17500				
Thallium	µg/L	ND	ND				
Vanadium	µg/L	5.1	8.8				
Zinc	µg/L	35.7	47.7				

Table 3-6. Point of Dredge 11-m Dissolved Metals Data

Sample ID		**C-11m (EVENT 2 ROUND 1)**	**C-11m (EVENT 2 ROUND 2)**	**DNREC**	**DNREC**	**DRBC**	**DRBC**
Lab Report ID		**C0D060501013**	**C0D060501015**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010				
MET							
Aluminum-Diss	µg/L	15.8	8				
Antimony-Diss	µg/L	0.34	0.8				
Arsenic-Diss	µg/L	0.84	0.46				
Barium-Diss	µg/L	18.1	17.1				
Beryllium-Diss	µg/L	ND	ND				
Cadmium-Diss	µg/L	ND	ND	1.52	0.20	2.84	0.90
Calcium-Diss	µg/L	11400	12500				
Chromium-Diss	µg/L	5.2	4.8	16	11	16	11
Cobalt-Diss	µg/L	0.057	0.035				
Copper-Diss	µg/L	1.6	1.4	10.25	7.00	13.52	9.25
Iron-Diss	µg/L	46.6	30.4				
Lead-Diss	µg/L	0.37	0.42	47.15	1.84	48	16
Magnesium-Diss	µg/L	3510	4160				
Manganese-Diss	µg/L	14.5	8.9				
Nickel-Diss	µg/L	1.8	1.3	367.08	40.77	1111.87	123.61
Potassium-Diss	µg/L	1490	1710				
Selenium-Diss	µg/L	1.3	1.1				
Silver-Diss	µg/L	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	14000	18300				
Thallium-Diss	µg/L	ND	ND				
Vanadium-Diss	µg/L	ND	0.4				
Zinc-Diss	µg/L	12.1	9.8	91.83	92.58	91.71	83.06

Table 3-7. Point of Dredge 6-m Pesticides and PCB Aroclor Data

Sample ID		**C-6m (EVENT 2 ROUND 1)**	**C-6m (EVENT 2 ROUND 2)**	**DNREC**	**DNREC**	**DRBC**	**DRBC**
Lab Report ID		**C0D060501014**	**C0D060501016**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010				
GCSEMI							
4,4-DDD	µg/L	ND	0.00094	1.1	0.001	0.55	0.001
4,4-DDE	µg/L	ND	0.001	1.1	0.001	0.55	0.001
4,4-DDT	µg/L	ND	ND	1.1	0.001	0.55	0.001
Aldrin	µg/L	ND	ND	3.0	none	1.5	none
alpha-BHC	µg/L	ND	ND				
alpha-Chlordane	µg/L	ND	ND				
Aroclor 1016	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1221	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1232	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1242	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1248	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1254	µg/L	ND	ND	none	0.014	1.0	0.014
Aroclor 1260	µg/L	ND	ND	none	0.014	1.0	0.014
beta-BHC	µg/L	ND	ND				
Chlordane (technical)	µg/L	ND	ND	2.4	0.0043	1.2	0.0043
Chlorpyrifos	µg/L	ND	ND	0.083	0.041	0.083	0.041
delta-BHC	µg/L	ND	ND				
Dieldrin	µg/L	ND	0.0016	0.24	0.056	1.25	0.0019
Endosulfan I	µg/L	ND	ND	0.22	0.056	0.11	0.056
Endosulfan II	µg/L	0.0011	0.0013	0.22	0.056	0.11	0.056
Endosulfan sulfate	µg/L	ND	ND				
Endrin	µg/L	ND	ND	0.086	0.036	0.09	0.0023
Endrin aldehyde	µg/L	ND	ND				
Endrin ketone	µg/L	ND	ND				
gamma-BHC (Lindane)	µg/L	0.0013	0.002	none	none	1.0	0.08
gamma-Chlordane	µg/L	ND	ND				
Heptachlor	µg/L	0.0032	0.0021	0.52	0.0038	0.26	0.0038
Heptachlor epoxide	µg/L	ND	ND				
Methoxychlor	µg/L	ND	ND	none	0.03	none	none
Parathion	µg/L	ND	ND	0.065	0.013	0.065	0.013
Toxaphene	µg/L	ND	ND	0.73	0.0002	0.73	0.0002

Table 3-8. Point of Dredge 6-m Semi-volatile Data

Sample ID		C-6m (EVENT 2 ROUND 1)	C-6m (EVENT 2 ROUND 2)	DNREC	DNREC	DRBC	DRBC
Lab Report ID		**C0D060501014**	**C0D060501016**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010				
MSSEMI							
1,1-Biphenyl	µg/L	ND	ND				
1,2,4-Trichlorobenzene	µg/L	ND	ND				
1,2-Dichlorobenzene	µg/L	ND	ND				
1,2-Diphenylhydrazine	µg/L	ND	ND				
1,3-Dichlorobenzene	µg/L	ND	ND				
1,4-Dichlorobenzene	µg/L	ND	ND				
2,4,5-Trichlorophenol	µg/L	ND	ND				
2,4,6-Trichlorophenol	µg/L	ND	ND				
2,4-Dichlorophenol	µg/L	ND	ND				
2,4-Dimethylphenol	µg/L	ND	ND				
2,4-Dinitrophenol	µg/L	ND	ND				
2,4-Dinitrotoluene	µg/L	ND	ND				
2,6-Dinitrotoluene	µg/L	ND	ND				
2-Chloronaphthalene	µg/L	ND	ND				
2-Chlorophenol	µg/L	ND	ND				
2-Methylnaphthalene	µg/L	ND	ND				
2-Methylphenol	µg/L	ND	ND				
2-Nitroaniline	µg/L	ND	ND				
2-Nitrophenol	µg/L	ND	ND				
3,3-Dichlorobenzidine	µg/L	ND	ND				
3-Nitroaniline	µg/L	ND	ND				
4,6-Dinitro-2-methylphenol	µg/L	ND	ND				
4-Bromophenyl phenyl ether	µg/L	ND	ND				
4-Chloro-3-methylphenol	µg/L	ND	ND				
4-Chloroaniline	µg/L	ND	ND				
4-Chlorophenyl phenyl ether	µg/L	ND	ND				
4-Methylphenol	µg/L	ND	ND				
4-Nitroaniline	µg/L	ND	ND				
4-Nitrophenol	µg/L	ND	ND				
Acenaphthene	µg/L	ND	ND				
Acenaphthylene	µg/L	ND	ND				
Acetophenone	µg/L	ND	ND				
Anthracene	µg/L	ND	ND				
Atrazine	µg/L	ND	ND				
Benzaldehyde	µg/L	ND	ND				
Benzidine	µg/L	ND	ND				
Benzo(a)anthracene	µg/L	ND	ND				

Table 3-8. (Continued)

Sample ID		C-6m (EVENT 2 ROUND 1)	C-6m (EVENT 2 ROUND 2)	DNREC	DNREC	DRBC	DRBC
Lab Report ID		C0D060501014	C0D060501016	Acute	Chronic	Acute	Chronic
Sample Date		4/1/2010	4/1/2010				
Benzo(a)pyrene	µg/L	ND	ND				
Benzo(b)fluoranthene	µg/L	ND	ND				
Benzo(ghi)perylene	µg/L	ND	ND				
Benzo(k)fluoranthene	µg/L	ND	ND				
bis(2-Chloroethoxy)methane	µg/L	ND	ND				
bis(2-Chloroethyl) ether	µg/L	ND	ND				
bis(2-Chloroisopropyl) ether	µg/L	ND	ND				
bis(2-Ethylhexyl) phthalate	µg/L	ND	ND				
Butyl benzyl phthalate	µg/L	0.91	0.51				
Caprolactam	µg/L	ND	ND				
Carbazole	µg/L	ND	ND				
Chrysene	µg/L	ND	ND				
Di-n-butyl phthalate	µg/L	ND	0.12				
Di-n-octyl phthalate	µg/L	ND	ND				
Dibenz(a,h)anthracene	µg/L	ND	ND				
Dibenzofuran	µg/L	ND	ND				
Diethyl phthalate	µg/L	ND	ND				
Dimethyl phthalate	µg/L	ND	ND				
Fluoranthene	µg/L	ND	0.059				
Fluorene	µg/L	ND	ND				
Hexachlorobenzene	µg/L	ND	ND				
Hexachlorobutadiene	µg/L	ND	ND				
Hexachlorocyclopentadiene	µg/L	ND	ND				
Hexachloroethane	µg/L	ND	ND				
Indeno(1,2,3-cd)pyrene	µg/L	ND	ND				
Isophorone	µg/L	ND	ND				
N-Nitrosodi-n-propylamine	µg/L	ND	ND				
N-Nitrosodimethylamine	µg/L	ND	ND				
N-Nitrosodiphenylamine	µg/L	ND	ND				
Naphthalene	µg/L	ND	ND				
Nitrobenzene	µg/L	ND	ND				
Pentachlorophenol	µg/L	ND	ND	8.72	6.69	9.07	5.73
Phenanthrene	µg/L	0.055	0.1				
Phenol	µg/L	ND	ND				
Pyrene	µg/L	ND	0.041				

Table 3-9. Point of Dredge 6-m Total Metals Data

Sample ID		**C-6m (EVENT 2 ROUND 1)**	**C-6m (EVENT 2 ROUND 2)**	**DNREC**	**DNREC**	**DRBC**	**DRBC**
Lab Report ID		**C0D060501014**	**C0D060501016**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010				
MET							
Aluminum	µg/L	**970**	**2720**	750	**87**	750	**87**
Antimony	µg/L	0.34	0.36				
Arsenic	µg/L	1.3	2.2	340	150	360	190
Barium	µg/L	26.4	36.3				
Beryllium	µg/L	0.067	0.11				
Cadmium	µg/L	ND	ND				
Calcium	µg/L	11700	13200				
Chromium	µg/L	6.9	11.7				
Cobalt	µg/L	0.7	1.7				
Copper	µg/L	3.4	6				
Cyanide, Total	µg/L	ND	ND	22	5.2	22	5.2
Iron	µg/L	1550	4040				
Lead	µg/L	2.4	5.7				
Magnesium	µg/L	3750	5270				
Manganese	µg/L	94.7	186				
Mercury	ng/L	5.6	6.1	1400	77	2400	12
Nickel	µg/L	1.5	3.7				
Potassium	µg/L	1860	2600				
Selenium	µg/L	0.74	0.78	20	5.0	20	5.0
Silver	µg/L	ND	ND				
Sodium	µg/L	13800	22400				
Thallium	µg/L	ND	ND				
Vanadium	µg/L	3.9	6				
Zinc	µg/L	20.8	38.4				

Table 3-10. Point of Dredge 6-m Dissolved Metals Data

Sample ID		**C-6m (EVENT 2 ROUND 1)**	**C-6m (EVENT 2 ROUND 2)**	**DNREC**	**DNREC**	**DRBC**	**DRBC**
Lab Report ID		**C0D060501014**	**C0D060501016**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010				
MET							
Aluminum-Diss	µg/L	6.2	43.5				
Antimony-Diss	µg/L	0.3	0.34				
Arsenic-Diss	µg/L	0.65	0.73				
Barium-Diss	µg/L	17.7	17.7				
Beryllium-Diss	µg/L	ND	ND				
Cadmium-Diss	µg/L	ND	ND	1.52	0.20	2.84	0.90
Calcium-Diss	µg/L	11100	12500				
Chromium-Diss	µg/L	5.6	5	16	11	16	11
Cobalt-Diss	µg/L	0.064	0.072				
Copper-Diss	µg/L	1.4	1.5	10.25	7.00	13.52	9.25
Iron-Diss	µg/L	32.8	76.7				
Lead-Diss	µg/L	0.29	0.39	47.15	1.84	48	16
Magnesium-Diss	µg/L	3400	4610				
Manganese-Diss	µg/L	25.4	11.9				
Nickel-Diss	µg/L	1.4	1.3	367.08	40.77	1111.87	123.61
Potassium-Diss	µg/L	1420	1860				
Selenium-Diss	µg/L	0.92	1.1				
Silver-Diss	µg/L	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	13700	22500				
Thallium-Diss	µg/L	ND	ND				
Vanadium-Diss	µg/L	ND	0.2				
Zinc-Diss	µg/L	11.3	9.7	91.83	92.58	91.71	83.06

Table 3-11. Point of Dredge Background Pesticide and PCB Aroclor Data

Sample ID		**BGU-11m**	**BGU-6m**	**BGD-11m**	**BGD-6m**	**DNREC**	**DNREC**	**DRBC**	**DRBC**
Lab Report ID		**C0D060501009**	**C0D060501010**	**C0D060501011**	**C0D060501012**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010				
GCSEMI									
4,4-DDD	µg/L	0.00074	0.00078	0.00077	0.00092	1.1	0.001	0.55	0.001
4,4-DDE	µg/L	**0.0013**	**0.0014**	**0.0017**	0.00088	1.1	**0.001**	0.55	**0.001**
4,4-DDT	µg/L	ND	ND	ND	ND	1.1	0.001	0.55	0.001
Aldrin	µg/L	ND	ND	ND	ND	3.0	none	1.5	none
alpha-BHC	µg/L	ND	ND	ND	ND				
alpha-Chlordane	µg/L	ND	ND	ND	ND				
Aroclor 1016	µg/L	ND	ND	ND	ND	none	0.014	1.0	0.014
Aroclor 1221	µg/L	ND	ND	ND	ND	none	0.014	1.0	0.014
Aroclor 1232	µg/L	ND	ND	ND	ND	none	0.014	1.0	0.014
Aroclor 1242	µg/L	ND	ND	ND	ND	none	0.014	1.0	0.014
Aroclor 1248	µg/L	ND	ND	ND	ND	none	0.014	1.0	0.014
Aroclor 1254	µg/L	ND	ND	ND	ND	none	0.014	1.0	0.014
Aroclor 1260	µg/L	ND	ND	ND	ND	none	0.014	1.0	0.014
beta-BHC	µg/L	ND	ND	ND	ND				
Chlordane (technical)	µg/L	ND	ND	ND	ND	2.4	0.0043	1.2	0.0043
Chlorpyrifos	µg/L	ND	ND	ND	ND	0.083	0.041	0.083	0.041
delta-BHC	µg/L	ND	ND	ND	ND				
Dieldrin	µg/L	0.0011	0.0012	0.0014	0.0012	0.24	0.056	1.25	0.0019
Endosulfan I	µg/L	ND	ND	ND	ND	0.22	0.056	0.11	0.056
Endosulfan II	µg/L	0.001	0.0011	0.001	0.0012	0.22	0.056	0.11	0.056
Endosulfan sulfate	µg/L	ND	ND	ND	ND				
Endrin	µg/L	ND	ND	ND	ND	0.086	0.036	0.09	0.0023
Endrin aldehyde	µg/L	ND	ND	ND	ND				
Endrin ketone	µg/L	ND	ND	ND	ND				
gamma-BHC (Lindane)	µg/L	0.0014	0.0014	0.0015	0.0018	none	none	1.0	0.08
gamma-Chlordane	µg/L	ND	ND	ND	ND				
Heptachlor	µg/L	0.0013	0.0012	0.0011	ND	0.52	0.0038	0.26	0.0038
Heptachlor epoxide	µg/L	ND	ND	ND	ND				

Table 3-11. (Continued)

Sample ID		**BGU-11m**	**BGU-6m**	**BGD-11m**	**BGD-6m**	**DNREC**	**DNREC**	**DRBC**	**DRBC**
Lab Report ID		**C0D060501009**	**C0D060501010**	**C0D060501011**	**C0D060501012**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010				
Methoxychlor	µg/L	ND	ND	ND	ND	none	0.03	none	none
Parathion	µg/L	ND	ND	ND	ND	0.065	0.013	0.065	0.013
Toxaphene	µg/L	ND	ND	ND	ND	0.73	0.0002	0.73	0.0002

Table 3-12. Point of Dredge Background Semi-volatile Data

Sample ID		**BGU-11m**	**BGU-6m**	**BGD-11m**	**BGD-6m**	**DNREC**	**DNREC**	**DRBC**	**DRBC**
Lab Report ID		**C0D060501009**	**C0D060501010**	**C0D060501011**	**C0D060501012**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010				
MSSEMI									
1,1-Biphenyl	µg/L	ND	ND	ND	ND				
1,2,4-Trichlorobenzene	µg/L	ND	ND	ND	ND				
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND				
1,2-Diphenylhydrazine	µg/L	ND	ND	ND	ND				
1,3-Dichlorobenzene	µg/L	ND	ND	ND	ND				
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND				
2,4,5-Trichlorophenol	µg/L	ND	ND	ND	ND				
2,4,6-Trichlorophenol	µg/L	ND	ND	ND	ND				
2,4-Dichlorophenol	µg/L	ND	ND	ND	ND				
2,4-Dimethylphenol	µg/L	ND	ND	ND	ND				
2,4-Dinitrophenol	µg/L	ND	ND	ND	ND				
2,4-Dinitrotoluene	µg/L	ND	ND	ND	ND				
2,6-Dinitrotoluene	µg/L	ND	ND	ND	ND				
2-Chloronaphthalene	µg/L	ND	ND	ND	ND				
2-Chlorophenol	µg/L	ND	ND	ND	ND				
2-Methylnaphthalene	µg/L	ND	ND	0.014	ND				
2-Methylphenol	µg/L	ND	ND	ND	ND				
2-Nitroaniline	µg/L	ND	ND	ND	ND				
2-Nitrophenol	µg/L	ND	ND	ND	ND				
3,3-Dichlorobenzidine	µg/L	ND	ND	ND	ND				
3-Nitroaniline	µg/L	ND	ND	ND	ND				
4,6-Dinitro-2-methylphenol	µg/L	ND	ND	ND	ND				
4-Bromophenyl phenyl ether	µg/L	ND	ND	ND	ND				
4-Chloro-3-methylphenol	µg/L	ND	ND	ND	ND				
4-Chloroaniline	µg/L	ND	ND	ND	ND				
4-Chlorophenyl phenyl ether	µg/L	ND	ND	ND	ND				
4-Methylphenol	µg/L	ND	ND	ND	ND				

Table 3-12. (Continued)

Sample ID		BGU-11m	BGU-6m	BGD-11m	BGD-6m	DNREC	DNREC	DRBC	DRBC
Lab Report ID		C0D060501009	C0D060501010	C0D060501011	C0D060501012	Acute	Chronic	Acute	Chronic
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010				
4-Nitroaniline	µg/L	ND	ND	ND	ND				
4-Nitrophenol	µg/L	ND	ND	ND	ND				
Acenaphthene	µg/L	ND	0.016	ND	ND				
Acenaphthylene	µg/L	ND	ND	ND	ND				
Acetophenone	µg/L	ND	ND	ND	ND				
Anthracene	µg/L	ND	ND	ND	ND				
Atrazine	µg/L	ND	ND	ND	ND				
Benzaldehyde	µg/L	0.79	0.8	0.8	0.88				
Benzidine	µg/L	ND	ND	ND	ND				
Benzo(a)anthracene	µg/L	ND	0.23	ND	ND				
Benzo(a)pyrene	µg/L	ND	0.25	ND	ND				
Benzo(b)fluoranthene	µg/L	ND	0.43	ND	ND				
Benzo(ghi)perylene	µg/L	ND	0.43	ND	ND				
Benzo(k)fluoranthene	µg/L	ND	0.37	ND	ND				
bis(2-Chloroethoxy)methane	µg/L	ND	ND	ND	ND				
bis(2-Chloroethyl) ether	µg/L	ND	ND	ND	ND				
bis(2-Chloroisopropyl) ether	µg/L	ND	ND	ND	ND				
bis(2-Ethylhexyl) phthalate	µg/L	ND	ND	ND	ND				
Butyl benzyl phthalate	µg/L	0.23	ND	ND	1				
Caprolactam	µg/L	ND	ND	ND	ND				
Carbazole	µg/L	ND	ND	ND	ND				
Chrysene	µg/L	ND	0.27	ND	ND				
Di-n-butyl phthalate	µg/L	ND	ND	ND	0.14				
Di-n-octyl phthalate	µg/L	ND	0.34	ND	ND				
Dibenz(a,h)anthracene	µg/L	ND	0.4	ND	ND				
Dibenzofuran	µg/L	ND	ND	ND	ND				
Diethyl phthalate	µg/L	ND	ND	ND	ND				
Dimethyl phthalate	µg/L	ND	ND	ND	ND				

Table 3-12. (Continued)

Sample ID		BGU-11m	BGU-6m	BGD-11m	BGD-6m	DNREC	DNREC	DRBC	DRBC
Lab Report ID		C0D060501009	C0D060501010	C0D060501011	C0D060501012	Acute	Chronic	Acute	Chronic
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010				
Fluoranthene	µg/L	0.02	0.042	0.026	0.031				
Fluorene	µg/L	ND	ND	ND	ND				
Hexachlorobenzene	µg/L	ND	ND	ND	ND				
Hexachlorobutadiene	µg/L	ND	ND	ND	ND				
Hexachlorocyclopentadiene	µg/L	ND	ND	ND	ND				
Hexachloroethane	µg/L	ND	ND	ND	ND				
Indeno(1,2,3-cd)pyrene	µg/L	ND	0.45	ND	ND				
Isophorone	µg/L	ND	ND	ND	ND				
N-Nitrosodi-n-propylamine	µg/L	ND	ND	ND	ND				
N-Nitrosodimethylamine	µg/L	ND	ND	ND	ND				
N-Nitrosodiphenylamine	µg/L	ND	ND	ND	ND				
Naphthalene	µg/L	ND	0.027	0.035	0.015				
Nitrobenzene	µg/L	ND	ND	ND	ND				
Pentachlorophenol	µg/L	ND	ND	ND	ND	8.72	6.69	9.07	5.73
Phenanthrene	µg/L	0.054	0.06	0.08	0.084				
Phenol	µg/L	ND	ND	ND	ND				
Pyrene	µg/L	0.021	0.043	0.031	0.023				

Table 3-13. Point of Dredge background Total Metals Data

Sample ID		**BGU-11m**	**BGU-6m**	**BGD-11m**	**BGD-6m**	**DNREC**	**DNREC**	**DRBC**	**DRBC**
Lab Report ID		**C0D060501009**	**C0D060501010**	**C0D060501011**	**C0D060501012**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010				
MET									
Aluminum	µg/L	**1460**	**2460**	**5200**	**2700**	750	**87**	750	**87**
Antimony	µg/L	0.83	0.5	0.54	0.39				
Arsenic	µg/L	0.78	1.4	2.2	1.5	340	150	360	190
Barium	µg/L	29.4	37.8	55.3	36.4				
Beryllium	µg/L	0.1	0.16	0.3	0.089				
Cadmium	µg/L	ND	ND	ND	ND				
Calcium	µg/L	12000	12200	13600	13000				
Chromium	µg/L	7.3	9.8	17.9	11.6				
Cobalt	µg/L	0.95	1.7	3.5	1.9				
Copper	µg/L	3.9	5.7	10.1	6.1				
Cyanide, Total	µg/L	ND	ND	ND	ND	22	5.2	22	5.2
Iron	µg/L	2150	3760	7890	4230				
Lead	µg/L	3.5	5.7	11.6	6.2				
Magnesium	µg/L	3930	4160	5750	5110				
Manganese	µg/L	108	193	378	198				
Mercury	ng/L	10.4	4.7	**37.6**	5.6	1400	77	2400	**12**
Nickel	µg/L	2.1	3.3	6.9	3.9				
Potassium	µg/L	2020	2170	3030	2520				
Selenium	µg/L	1.2	0.52	0.7	0.58	20	5.0	20	5.0
Silver	µg/L	ND	ND	0.069	ND				
Sodium	µg/L	14400	14200	20500	20600				
Thallium	µg/L	ND	ND	ND	ND				
Vanadium	µg/L	4.4	5.3	9.4	5.3				
Zinc	µg/L	26.6	36.6	66.4	35.8				

Table 3-14. Point of Dredge Background Dissolved Metals Data

Sample ID		**BGU-11m**	**BGU-6m**	**BGD-11m**	**BGD-6m**	**DNREC**	**DNREC**	**DRBC**	**DRBC**
Lab Report ID		**C0D060501009**	**C0D060501010**	**C0D060501011**	**C0D060501012**	**Acute**	**Chronic**	**Acute**	**Chronic**
Sample Date		4/1/2010	4/1/2010	4/1/2010	4/1/2010				
MET									
Aluminum-Diss	µg/L	7	9.9	8.3	126				
Antimony-Diss	µg/L	0.33	0.91	0.33	0.27				
Arsenic-Diss	µg/L	0.63	1.2	0.42	0.89				
Barium-Diss	µg/L	17.8	18.4	15.8	16.8				
Beryllium-Diss	µg/L	ND	ND	ND	ND				
Cadmium-Diss	µg/L	ND	ND	ND	ND	1.52	0.20	2.84	0.90
Calcium-Diss	µg/L	12000	12000	12400	12400				
Chromium-Diss	µg/L	5.2	6	5.7	5.8	16	11	16	11
Cobalt-Diss	µg/L	0.058	0.063	0.035	0.11				
Copper-Diss	µg/L	1.1	1.4	1.4	1.7	10.25	7.00	13.52	9.25
Iron-Diss	µg/L	30.6	30.3	29.6	218				
Lead-Diss	µg/L	0.42	0.4	0.45	0.66	47.15	1.84	48	16
Magnesium-Diss	µg/L	3620	3640	4280	4440				
Manganese-Diss	µg/L	11.2	14.1	3.7	12.1				
Nickel-Diss	µg/L	3.4	1.5	1.6	2.2	367.08	40.77	1111.87	123.61
Potassium-Diss	µg/L	1570	1500	1730	1790				
Selenium-Diss	µg/L	1.2	1.2	1.1	1				
Silver-Diss	µg/L	ND	ND	ND	ND	1.96	none	2.47	none
Sodium-Diss	µg/L	14600	14600	19800	20600				
Thallium-Diss	µg/L	ND	ND	ND	ND				
Vanadium-Diss	µg/L	ND	0.2	0.78	1.7				
Zinc-Diss	µg/L	15.1	10.2	10.6	11.9	91.83	92.58	91.71	83.06

Table 3-15. PCB homolog concentrations observed at the 11 meter depths 200 feet down current of the working cutterhead and at upriver and downriver background stations sampled in Reach C during spring 2010

		BGU-11m	BGD-11m	11-m (ROUND 1)	11-m (ROUND 2)	DNREC Acute	DNREC Chronic	DRBC Acute	DRBC Chronic
Monochlorobiphenyl	ng/L	0.033	0.014	0.018	0.014				
Dichlorobiphenyl	ng/L	0.17	0.15	0.13	0.1				
Trichlorobiphenyl	ng/L	0.45	0.46	0.4	0.32				
Tetrachlorobiphenyl	ng/L	0.89	1.2	0.89	0.82				
Pentachlorobipheny	ng/L	1.7	2.5	1.7	1.5				
Hexachlorobiphenyl	ng/L	1.5	2	1.3	1.3				
Heptachlorobiphenyl	ng/L	0.85	1	0.68	0.61				
Octachlorobiphenyl	ng/L	0.34	0.47	0.26	0.26				
Nonachlorobiphenyl	ng/L	0.49	1.2	0.48	0.53				
Decachlorobiphenyl	ng/L	0.48	1.6	0.65	0.58				
Sum of PCB Congeners	ng/L	6.903	10.594	6.508	6.034	none	14,000	1,000,000	14,000

Table 3-16. Dioxin and Furan homolog concentrations observed at the 11 meter depths 200 feet down current of the working cutterhead and at upriver and downriver background stations sampled in Reach C during spring 2010

		BGU-11m	BGD-11m	11-m (ROUND 1)	11-m (ROUND 2)
Total HpCDD	pg/L	12	15	17	26
Total HpCDF	pg/L	ND	ND	3.3	2.6
Total HxCDD	pg/L	3.5	ND	ND	9
Total HxCDF	pg/L	1.1	ND	ND	ND
Total PeCDD	pg/L	ND	ND	ND	ND
Total PeCDF	pg/L	1.6	ND	ND	ND
Total TCDD	pg/L	ND	ND	ND	ND
Total TCDF	pg/L	ND	ND	ND	8.5
OCDD	pg/L	110	140	130	270
OCDF	pg/L	<95	6.7	9.6	7
Sum of Dioxin Homologs	pg/L	128.2	161.7	159.9	323.1

3.3 CONTAMINANT LEVELS RELATIVE TO BACKGROUND

To evaluate whether the dredging activities elevated contaminant concentrations the minimum, maximum, and average concentrations were calculated for all the 6 and 11 meter samples taken at the point of dredge and compared to the concentrations reported for the background samples. Only parameters that were detected in both cutterhead plume and background samples were included in this comparison. With the exception of 4,4-DDD, gamma-BHC, and Heptachlor the ratio of mean Point of Dredge concentration to mean background concentration was near or below 1.0. The results of this analysis suggest that concentrations behind the cutterhead (e.g., the 6 and 11 meter samples) were not dramatically altered relative to parameters measured in the background collections (Table 3-17).

Table 3-17. Comparison of the minimum, maximum, and average contaminant concentrations observed at the Point of Dredge samples relative to those recorded in the background samples taken near the dredge boat Pullen while working in Reach C during spring of 2010. Values above 1.0 in the ratio column indicate Point of Dredge concentration was higher than background. Values less than 1.0 indicate background concentration was higher than Point of Dredge concentration.

		Point of Drege Min	Point of Dredge Max	Ave Point of Dredge	Back-ground Min	Back-ground Max	Ave Back-ground	Ratio Dredge/ Back-ground
GCSEMI								
4,4-DDD	µg/L	0.00094	0.0013	0.0013	0.00074	0.00092	0.0008025	1.62
4,4-DDE	µg/L	0.001	0.0016	0.0015	0.00088	0.0017	0.00132	1.14
Dieldrin	µg/L	0.0012	0.0016	0.00135	0.0011	0.0014	0.001225	1.10
Endosulfan II	µg/L	0.0011	0.0013	0.0011	0.001	0.0012	0.001075	1.02
gamma-BHC (Lindane)	µg/L	0.0013	0.0035	0.0035	0.0014	0.0018	0.001525	2.30
Heptachlor	µg/L	0.0021	0.0032	0.0022	0.0011	0.0013	0.0012	1.83
MET								
Aluminum	µg/L	970	3660	2970	1460	5200	2955	1.01
Aluminum-Diss	µg/L	6.2	43.5	11.9	7	126	37.8	0.31
Antimony	µg/L	0.34	0.42	0.4	0.39	0.83	0.565	0.71
Antimony-Diss	µg/L	0.3	0.8	0.57	0.27	0.91	0.46	1.24
Arsenic	µg/L	1.3	2.5	2.05	0.78	2.2	1.47	1.39
Arsenic-Diss	µg/L	0.46	0.84	0.65	0.42	1.2	0.785	0.83
Barium	µg/L	26.4	44.5	40.25	29.4	55.3	39.725	1.01
Barium-Diss	µg/L	17.1	18.1	17.6	15.8	18.4	17.2	1.02
Beryllium	µg/L	0.067	0.24	0.19	0.089	0.3	0.162	1.17
Calcium	µg/L	11700	13200	12100	12000	13600	12700	0.95
Calcium-Diss	µg/L	11100	12500	11950	12000	12400	12200	0.98
Chromium	µg/L	6.9	14	12.05	7.3	17.9	11.65	1.03
Chromium-Diss	µg/L	4.8	5.6	5	5.2	6	5.675	0.88
Cobalt	µg/L	0.7	2.5	2.05	0.95	3.5	2.0125	1.02
Cobalt-Diss	µg/L	0.035	0.072	0.046	0.035	0.11	0.067	0.69
Copper	µg/L	3.4	7.8	6.75	3.9	10.1	6.45	1.05
Copper-Diss	µg/L	1.4	1.6	1.5	1.1	1.7	1.4	1.07
Iron	µg/L	1550	5600	4565	2150	7890	4507.5	1.01
Iron-Diss	µg/L	30.4	76.7	38.5	29.6	218	77.125	0.50
Lead	µg/L	2.4	8.1	6.8	3.5	11.6	6.75	1.01
Lead-Diss	µg/L	0.29	0.42	0.395	0.4	0.66	0.483	0.82
Magnesium	µg/L	3750	5270	4430	3930	5750	4737.5	0.94
Magnesium-Diss	µg/L	3400	4610	3835	3620	4440	3995	0.96
Manganese	µg/L	94.7	272	230	108	378	219.25	1.05
Manganese-Diss	µg/L	8.9	25.4	11.7	3.7	14.1	10.275	1.14
Mercury	µg/L	2.1	6.6	4.35	4.7	37.6	14.575	0.30
Nickel	µg/L	1.5	4.8	4.05	2.1	6.9	4.05	1.00
Nickel-Diss	µg/L	1.3	1.8	1.55	1.5	3.4	2.175	0.71

Table 3-17. (Continued)

		Point of Dredge Min	Point of Dredge Max	Ave Point of Dredge	Back-ground Min	Back-ground Max	Ave Back-ground	Ratio Dredge/ Back.
Potassium	µg/L	1860	2600	2325	2020	3030	2435	0.95
Potassium-Diss	µg/L	1420	1860	1600	1500	1790	1647.5	0.97
Selenium	µg/L	0.74	0.83	0.82	0.52	1.2	0.75	1.09
Selenium-Diss	µg/L	0.92	1.3	1.2	1	1.2	1.125	1.07
Silver	µg/L	0.053	0.053	0.053	0.069	0.069	0.069	0.77
Sodium	µg/L	13500	22400	15500	14200	20600	17425	0.89
Sodium-Diss	µg/L	13700	22500	16150	14600	20600	17400	0.93
Vanadium	µg/L	3.9	8.8	6.95	4.4	9.4	6.1	1.14
Vanadium-Diss	µg/L	0.2	0.4	0.4	0.2	1.7	0.89	0.45
Zinc	µg/L	20.8	47.7	41.7	26.6	66.4	41.35	1.01
Zinc-Diss	µg/L	9.7	12.1	10.95	10.2	15.1	11.95	0.92
DOC	mg/L	2.9	3	2.9	2.8	3	2.95	0.98
POC	mg/L	1.7	6	5.25	4.1	7.8	5.225	1.00
TSS	mg/L	34.4	135	115.1	104	182	124.25	0.93
MSSEMI								
2-Methylnaphthalene	µg/L	0.013	0.013	0.013	0.014	0.014	0.014	0.93
Benzaldehyde	µg/L	0.89	0.89	0.89	0.79	0.88	0.818	1.09
Butyl benzyl phthalate	µg/L	0.51	0.91	0.665	0.23	1	0.615	1.08
Di-n-butyl phthalate	µg/L	0.12	0.12	0.12	0.14	0.14	0.14	0.86
Fluoranthene	µg/L	0.031	0.059	0.036	0.02	0.042	0.030	1.21
Naphthalene	µg/L	0.026	0.026	0.026	0.015	0.035	0.026	1.01
Phenanthrene	µg/L	0.055	0.1	0.0905	0.054	0.084	0.070	1.30
Pyrene	µg/L	0.035	0.041	0.035	0.021	0.043	0.030	1.19

4.0 MASS BALANCE RESULTS

The act of hydraulic dredging removes Delaware River sediments and associated contaminants and places them in a CDF where the pumped slurry is dewatered. Most of the contaminants in the sediment settles out and remains in the upland disposal site while a percentage stays in suspension and is ultimately discharged back into the river through the weir. Previous studies funded by the Philadelphia District evaluating maintenance dredging operations in the Marcus Hook area indicated that over 95% of the contaminants are sequestered in the CDF[4], a net benefit from an aquatic toxicology perspective. CDF retention efficiencies can be calculated by multiplying the mean contaminant concentration in the inlet samples by an estimate of the total kilograms of material pumped into the CDF and comparing that to similar estimates of total kilograms of contaminants discharged at the weir over a prescribed period of time. To evaluate the CDF efficiencies for the Reach C deepening work dredging logs from the Pullen were obtained and the accumulative cubic yards as of June 7, 2010 for "new work" was inputted into a mass balance spread sheet (1,011,561 cubic yards placed into cell 2 of the Killcohook CDF). Total cubic yards of dredged material were converted to total kg of dry sediment by multiplying cubic yards times 830.7 as per Greene (2010[5]). Inlet sample data from the 3/18, 3/24, 4/19, and 5/17 collections (Appendix A) were used to calculate average inlet contaminant concentrations. Using the weir discharge flow data recorded by the ISCO area velocity meters installed in the discharge pipes between 3/15 and 6/7/2010 the total liters discharged for the time period was calculated. Multiplying the total discharge (3.1 billion liters) by the mean weir concentrations measured among 15 weir samples collected between 3/18 and 5/4 at cell 2 provides an estimate of the total kilograms of contaminants that were released back into the Delaware River as of June 7. Only parameters detected in both the inlet and weir samples were included in the analysis and non-detections were assumed to be zero. Total metals data, which includes dissolved metals, was used for this analysis.

The estimated contaminant sequestering efficiencies for Killcolhook cell 2 CDF were high, all above 90% (Table 4-1). The pesticide Dieldrin had the lowest retention efficiency of 94.7% largely due to one weir sample with high concentration 0.013 ug/L on April 22. Aldrin had retention efficiency of 97%, while 98% of the Aroclor 1242 PCBs, alpha-BHC, and Endosulfan sulfate were captured by the CDF. All other metal and organic parameters had retention efficiencies of 99% or better. Delaware River dredged material has been used for a variety of beneficial uses. Past testing of dried dredged material has shown that concentrations of contaminants retained in the sites are not high enough to require any special consideration for how the material is used.

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[4] **Burton and Farrar 2003.** Contaminant Sequestering And Water Quality Discharges At Confined Disposal Facilities. In: M. Pellei and A. Porta (Eds.), Remediation of Contaminated Sediments—2003. Proceedings of the Second International Conference on Remediation of Contaminated Sediments (Venice, Italy; 30 Sep–3 Oct 2003). ISBN 1-57477- 143-4, published by Battelle Press, Columbus, OH, www.battelle.org/bookstore.

[5] **Greene, R. 2010**. An Evaluation of Toxic Contaminants in the Sediments of the Tidal Delaware River and Potential Impacts Resulting from Deepening the Main Navigation Channel in Reach C. Delaware Department of Natural Resources and Environmental Control, Division of Water Resources Watershed Assessment Branch, Dover, DE. Final of June 7, 2010.

Table 4-1. Mass balance estimate and estimated Cell 2 sequestering efficiencies (%) at Killcohook among the various contaminants detected in both the inlet and weir samples.

Total Liters Discharged from Cell 2	3,103,198,154
Total Kg pumped into Cell 2	840,303,722.70

Weir/Inlet Parameters Detected	Unit	Ave Weir Con.	Total kg Discharged from Weir	Ave Inlet Con.	Unit	Total kg into CDF	Percent (%) Sequestered in CDF
GCSEMI							
4,4-DDD	µg/L	0.002	0.007	401.150	ug/kg	337.088	99.9979
4,4-DDE	µg/L	0.002	0.007	36.925	ug/kg	31.028	99.9788
4,4-DDT	µg/L	0.007	0.022	210.770	ug/kg	177.111	99.9873
Aldrin	µg/L	0.001	0.004	0.185	ug/kg	0.155	97.2053
alpha-BHC	µg/L	0.002	0.006	0.295	ug/kg	0.248	97.7663
Aroclor 1242	µg/L	0.044	0.137	10.000	ug/kg	8.403	98.3751
beta-BHC	µg/L	0.005	0.014	2.000	ug/kg	1.681	99.1599
Dieldrin	µg/L	0.007	0.022	0.497	ug/kg	0.417	94.7208
Endosulfan sulfate	µg/L	0.003	0.008	0.480	ug/kg	0.403	97.9227
Endrin	µg/L	0.013	0.040	1.100	ug/kg	0.924	95.6356
gamma-BHC (Lindane)	µg/L	0.003	0.009	0.940	ug/kg	0.790	98.8843
gamma-Chlordane	µg/L	0.002	0.007	53.760	ug/kg	45.175	99.9854
Heptachlor epoxide	µg/L	0.004	0.012	7.055	ug/kg	5.928	99.8037
MET							
Aluminum	µg/L	7210.400	22375.300	14175.000	mg/kg	11911305.269	99.8122
Antimony	µg/L	0.837	2.598	0.413	mg/kg	346.625	99.2504
Arsenic	µg/L	7.460	23.150	11.025	mg/kg	9264.349	99.7501
Barium	µg/L	81.860	254.028	53.700	mg/kg	45124.310	99.4370
Beryllium	µg/L	0.347	1.078	0.820	mg/kg	689.049	99.8436
Cadmium	µg/L	0.510	1.583	0.515	mg/kg	432.756	99.6343
Chromium	µg/L	19.920	61.816	41.600	mg/kg	34956.635	99.8232

Table 4-1. (Continued)

Weir/Inlet Parameters Detected	Unit	Ave Weir Con.	Total kg Discharged from Weir	Ave Inlet Con.	Unit	Total kg into CDF	Percent (%) Sequestered in CDF
MET							
Cobalt	µg/L	4.133	12.827	10.625	mg/kg	8928.227	99.8563
Copper	µg/L	8.840	27.432	22.025	mg/kg	18507.689	99.8518
Iron	µg/L	7400.000	22963.666	25725.000	mg/kg	21616813.266	99.8938
Lead	µg/L	8.280	25.694	38.575	mg/kg	32414.716	99.9207
Mercury	**ng/L**	18.933	0.059	151.150	ug/kg	127.012	99.9537
Nickel	µg/L	9.587	29.749	21.050	mg/kg	17688.393	99.8318
Selenium	µg/L	2.350	7.293	0.813	mg/kg	682.747	98.9319
Silver	µg/L	0.081	0.253	0.280	mg/kg	235.285	99.8926
Thallium	µg/L	0.140	0.435	0.205	mg/kg	172.262	99.7473
Vanadium	µg/L	15.454	47.956	40.200	mg/kg	33780.210	99.8580
Zinc	µg/L	70.707	219.417	148.250	mg/kg	124575.027	99.8239
MSSEMI							
2-Methylnaphthalene	µg/L	0.017	0.054	15.667	ug/kg	13164.758	99.9996
2-Methylphenol	µg/L	0.014	0.043	20.000	ug/kg	16806.074	99.9997
4-Methylphenol	µg/L	0.029	0.090	18.500	ug/kg	15545.619	99.9994
Benzaldehyde	µg/L	0.690	2.141	167.000	ug/kg	140330.722	99.9985
Benzo(a)anthracene	µg/L	0.047	0.146	41.500	ug/kg	34872.604	99.9996
Benzo(a)pyrene	µg/L	0.039	0.121	41.750	ug/kg	35082.680	99.9997
Benzo(b)fluoranthene	µg/L	0.046	0.143	46.750	ug/kg	39284.199	99.9996
Benzo(ghi)perylene	µg/L	0.052	0.161	34.333	ug/kg	28850.428	99.9994
bis(2-Ethylhexyl) phthalate	µg/L	4.423	13.726	95.750	ug/kg	80459.081	99.9829
Butyl benzyl phthalate	µg/L	1.174	3.643	96.000	ug/kg	80669.157	99.9955

Table 4-1. (Continued)

Weir/Inlet Parameters Detected	Unit	Ave Weir Con.	Total kg Discharged from Weir	Ave Inlet Con.	Unit	Total kg into CDF	Percent (%) Sequestered in CDF
MSSEMI							
Chrysene	µg/L	0.044	0.137	48.250	ug/kg	40544.655	99.9997
Di-n-butyl phthalate	µg/L	0.181	0.562	140.000	ug/kg	117642.521	99.9995
Dibenz(a,h)anthracene	µg/L	0.063	0.194	7.450	ug/kg	6260.263	99.9969
Fluoranthene	µg/L	0.024	0.076	70.750	ug/kg	59451.488	99.9999
Indeno(1,2,3-cd)pyrene	µg/L	0.056	0.174	28.333	ug/kg	23808.605	99.9993
Pentachlorophenol	µg/L	3.000	9.310	20.500	ug/kg	17226.226	99.9460
Phenanthrene	µg/L	0.085	0.265	45.750	ug/kg	38443.895	99.9993
Pyrene	µg/L	0.020	0.062	61.250	ug/kg	51468.603	99.9999

5.0 CONCLUSION

Dredging for the Delaware River Main Stem Channel Deepening Project began on March 1, 2010. The first construction contract is for Reach C of the channel, which extends from the Delaware Memorial Bridge to Elsinboro Point, NJ. Environmental monitoring for potential water quality impacts is on-going at the Federally owned Killcohook dredged material containment facility and at the point of active dredging. The following conclusions are made based on monitoring data collected up to May 17, 2010:

(1) because of the limited number of exceedances of acute water quality criteria in weir discharge and Delaware River samples collected close to the discharge it is concluded that operation of cells 2 and 3 of the Killcohook dredged material containment facility is not impacting water quality in the immediate vicinity of the discharge;

(2) considering that exceedances of chronic criteria were mostly infrequent, and at concentrations slightly above criteria, along with the amount of mixing that takes place in this portion of the Delaware River, it is concluded that water quality objectives established by the lower chronic criteria are being met in the Delaware River during this period of discharge from the Killcohook facility;

(3) a mass balance evaluation of the contaminant load entering and leaving cell 2 of the Killcohook facility indicates that for most contaminants detected in the material entering the site, greater than 99 percent of the contaminant load was retained in cell 2 and not released back to the Delaware River; and

(4) the lack of exceedances of both acute and chronic water quality criteria at the point of dredging, and data demonstrating that TSS levels down-current of the cutterhead are similar to background indicate that water quality is not being impacted at the dredge.

APPENDIX A

INLET SEDIMENT CONCENTRATIONS

Table A-1. Pesticide and PCB Aroclor concentrations in inlet samples from Cells 2 and 3 reported for Reach C Deepening in the spring of 2010

		Cell 2	Cell 2	Cell 2	Cell 2	Cell 3	Cell 3
Sample ID:		**INLET0318**	**INLET0324**	**INLET0419**	**INLET0517**	**INLET0422**	**INLET0504**
Laboratory ID:		**C0C190561001**	**C0C250608001**	**C0D200483001**	**C0E180468001**	**C0D230556001**	**C0E060550001**
Sample Date:		3/18/2010	3/24/2010	4/19/2010	5/17/2010	4/22/2010	5/4/2010
GCSEMI							
4,4-DDD	µg/kg	1	1.7	1600	1.9	<0.18	0.52
4,4-DDE	µg/kg	2.1	2.3	140	3.3	0.093	0.82
4,4-DDT	µg/kg	0.58	1	840	1.5	<0.18	0.57
Aldrin	µg/kg	0.16	0.21	<27	<2.3	0.073	0.074
alpha-BHC	µg/kg	0.34	0.25	<27	<2.3	<0.18	<0.20
alpha-Chlordane	µg/kg	2.1	<0.28	54	<2.3	<0.18	<0.20
Aroclor 1016	µg/kg	<4.6	<2.8	<2.7	<2.4	8	<1.0
Aroclor 1221	µg/kg	<4.6	<2.8	<2.7	<2.4	<1.7	<1.0
Aroclor 1232	µg/kg	<4.6	<2.8	<2.7	<2.4	<1.7	<1.0
Aroclor 1242	µg/kg	<4.6	<2.8	<2.7	<2.4	<1.7	<1.0
Aroclor 1248	µg/kg	<4.6	<2.8	10	<2.4	<1.7	<1.0
Aroclor 1254	µg/kg	<4.6	<2.8	<2.7	<2.4	<1.7	1.9
Aroclor 1260	µg/kg	<4.6	3.1	13	<2.4	<1.7	2.3
beta-BHC	µg/kg	1.9	<0.28	<27	2.1	<0.18	1.1
Chlordane (technical)	µg/kg	<4.6	<2.8	<270	<23	<1.8	<2.0
Chlorpyrifos	µg/kg	<91	<54	<54	<47	<35	<80
delta-BHC	µg/kg	<0.46	<0.28	<27	<2.3	0.15	0.083
Dieldrin	µg/kg	0.32	0.35	<27	0.82	0.054	0.24
Endosulfan I	µg/kg	<0.46	<0.28	<27	<2.3	<0.18	<0.20
Endosulfan II	µg/kg	<0.46	<0.28	<27	<2.3	<0.18	0.072
Endosulfan sulfate	µg/kg	<0.46	0.48	<27	<2.3	<0.18	0.16
Endrin	µg/kg	1.1	1.1	<27	<2.3	0.18	<0.20
Endrin aldehyde	µg/kg	<0.46	<0.28	<27	<2.3	<0.18	0.81
Endrin ketone	µg/kg	0.56	0.53	<27	<2.3	<0.18	0.25
gamma-BHC (Lindane)	µg/kg	1.1	0.9	<27	0.82	0.15	0.31
gamma-Chlordane	µg/kg	0.45	0.83	160	<2.3	0.28	0.53
Heptachlor	µg/kg	<0.46	<0.28	<27	<2.3	0.31	0.086
Heptachlor epoxide	µg/kg	0.11	<0.28	14	<2.3	<0.18	<0.20
Methoxychlor	µg/kg	<0.92	<0.55	<55	<4.7	<0.35	0.094
Parathion	µg/kg	<91	<54	<54	<47	<35	<80
Toxaphene	µg/kg	<18	<11	<1100	<93	<7.0	<8.1

Table A-2. Metal concentrations in inlet samples from Cells 2 and 3 reported for Reach C Deepening in the spring of 2010

		Cell 2	Cell 2	Cell 2	Cell 2	Cell 3	Cell 3
Sample ID:		**INLET0318**	**INLET0324**	**INLET0419**	**INLET0517**	**INLET0422**	**INLET0504**
Laboratory ID:		**C0C190561001**	**C0C250608001**	**C0D200483001**	**C0E180468001**	**C0D230556001**	**C0E060550001**
Sample Date:		3/18/2010	3/24/2010	4/19/2010	5/17/2010	4/22/2010	5/4/2010
MET							
Aluminum	mg/kg	14400	12700	17000	12600	18300	1750
Antimony	mg/kg	0.57	0.28	0.38	0.42	0.27	0.53
Arsenic	mg/kg	13.6	10.1	10.2	10.2	3.7	6.9
Barium	mg/kg	53.9	48.5	62.8	49.6	62.7	233
Beryllium	mg/kg	0.86	0.72	1	0.7	1	0.085
Cadmium	mg/kg	0.45	0.53	0.65	0.43	0.25	0.34
Calcium	mg/kg	3530	2370	2800	1930	863	184000
Chromium	mg/kg	43.3	42.1	42.8	38.2	31.2	12.8
Cobalt	mg/kg	10.4	10.9	11.9	9.3	15	4.6
Copper	mg/kg	22.4	22.6	25.5	17.6	18.2	53.4
Cyanide, Total	mg/kg	<2.8	<1.7	<1.7	0.98	<1.1	<1.2
Iron	mg/kg	25400	26700	27600	23200	31700	14000
Lead	mg/kg	35.9	37.8	41.1	39.5	15.7	14.6
Magnesium	mg/kg	6260	5320	6940	4340	5000	2680
Manganese	mg/kg	1120	1150	1260	867	312	3210
Mercury	ug/kg	168	139	205	92.6	21.1	27.6
Nickel	mg/kg	21.1	21.6	23.4	18.1	21.5	11.3
Potassium	mg/kg	2570	2120	2530	2050	1820	515
Selenium	mg/kg	0.52	0.92	1	0.81	0.37	0.76
Silver	mg/kg	0.32	0.24	0.33	0.23	0.035	0.78
Sodium	mg/kg	1040	1530	1290	1380	708	248
Thallium	mg/kg	0.28	0.18	0.2	0.16	0.2	0.081
Vanadium	mg/kg	43.6	37.9	41.4	37.9	31.7	10.3
Zinc	mg/kg	145	146	167	135	67.5	131

Table A-3. Semi-volatile concentrations in inlet samples from Cells 2 and 3 reported for Reach C Deepening in the spring of 2010

		Cell 2	Cell 2	Cell 2	Cell 2	Cell 3	Cell 3
Sample ID:		**INLET0318**	**INLET0324**	**INLET0419**	**INLET0517**	**INLET0422**	**INLET0504**
Laboratory ID:		**C0C190561001**	**C0C250608001**	**C0D200483001**	**C0E180468001**	**C0D230556001**	**C0E060550001**
Sample Date:		3/18/2010	3/24/2010	4/19/2010	5/17/2010	4/22/2010	5/4/2010
MSSEMI							
1,1-Biphenyl	µg/kg	<460	<110	<270	<190	<70	<80
1,2,4-Trichlorobenzene	µg/kg	<92	<22	<55	<38	<14	<16
1,2-Dichlorobenzene	µg/kg	<92	<22	<55	<38	<14	<16
1,2-Diphenylhydrazine	µg/kg	<92	<22	<55	<38	<14	<16
1,3-Dichlorobenzene	µg/kg	<92	<22	<55	<38	<14	<16
1,4-Dichlorobenzene	µg/kg	<92	<22	<55	<38	<14	<16
2,4,5-Trichlorophenol	µg/kg	<460	<110	<270	<190	<70	<80
2,4,6-Trichlorophenol	µg/kg	<460	<110	<270	<190	<70	<80
2,4-Dichlorophenol	µg/kg	<92	<22	<55	<38	<14	<16
2,4-Dimethylphenol	µg/kg	<460	<110	<270	<190	<70	<80
2,4-Dinitrophenol	µg/kg	<2300	<570	<1400	<960	<360	<410
2,4-Dinitrotoluene	µg/kg	<460	<110	<270	<190	<70	<80
2,6-Dinitrotoluene	µg/kg	<460	<110	<270	<190	<70	<80
2-Chloronaphthalene	µg/kg	<92	<22	<55	<38	<14	<16
2-Chlorophenol	µg/kg	<460	<110	<270	<190	<70	<80
2-Methylnaphthalene	µg/kg	<92	14	11	22	<14	3.8
2-Methylphenol	µg/kg	20	<110	<270	<190	<70	<80
2-Nitroaniline	µg/kg	<2300	<570	<1400	<960	<360	<410
2-Nitrophenol	µg/kg	<460	<110	<270	<190	<70	<80
3,3-Dichlorobenzidine	µg/kg	<460	<110	<270	<190	<70	<80
3-Nitroaniline	µg/kg	<2300	<570	<1400	<960	<360	<410
4,6-Dinitro-2-methylphenol	µg/kg	<2300	<570	<1400	<960	<360	<410
4-Bromophenyl phenyl ether	µg/kg	<460	<110	<270	<190	<70	<80
4-Chloro-3-methylphenol	µg/kg	<460	<110	<270	<190	<70	<80
4-Chloroaniline	µg/kg	<460	<110	<270	<190	<70	<80
4-Chlorophenyl phenyl ether	µg/kg	<460	<110	<270	<190	<70	<80
4-Methylphenol	µg/kg	21	16	<270	<190	<70	<80

Table A-3. (Continued)

		Cell 2	Cell 2	Cell 2	Cell 2	Cell 3	Cell 3
Sample ID:		**INLET0318**	**INLET0324**	**INLET0419**	**INLET0517**	**INLET0422**	**INLET0504**
Laboratory ID:		**C0C190561001**	**C0C250608001**	**C0D200483001**	**C0E180468001**	**C0D230556001**	**C0E060550001**
Sample Date:		3/18/2010	3/24/2010	4/19/2010	5/17/2010	4/22/2010	5/4/2010
4-Nitroaniline	µg/kg	<2300	<570	<1400	<960	<360	<410
4-Nitrophenol	µg/kg	<2300	<570	<1400	<960	<360	<410
Acenaphthene	µg/kg	<92	6	<55	6.4	<14	1.6
Acenaphthylene	µg/kg	<92	9	<55	11	<14	<16
Acetophenone	µg/kg	<460	<110	<270	<190	<70	<80
Anthracene	µg/kg	<92	17	13	25	<14	5
Atrazine	µg/kg	<460	<110	<270	<190	<70	<80
Benzaldehyde	µg/kg	230	98	220	120	<70	78
Benzidine	µg/kg	<9200	<2200	<5500	<3800	<1400	<1600
Benzo(a)anthracene	µg/kg	40	39	41	46	<14	16
Benzo(a)pyrene	µg/kg	36	43	41	47	22	14
Benzo(b)fluoranthene	µg/kg	35	71	21	60	<14	32
Benzo(ghi)perylene	µg/kg	<92	30	35	38	<14	12
Benzo(k)fluoranthene	µg/kg	<92	<22	<55	24	<14	<16
bis(2-Chloroethoxy)methane	µg/kg	<460	<110	<270	<190	<70	<80
bis(2-Chloroethyl) ether	µg/kg	<92	<22	<55	<38	<14	<16
bis(2-Chloroisopropyl) ether	µg/kg	<92	<22	<55	<38	<14	<16
bis(2-Ethylhexyl) phthalate	µg/kg	110	66	77	130	11	68
Butyl benzyl phthalate	µg/kg	140	<110	52	<190	<70	15
Caprolactam	µg/kg	<2300	<570	<1400	<960	<360	<410
Carbazole	µg/kg	<92	4.3	<55	<38	<14	<16
Chrysene	µg/kg	41	44	52	56	<14	16
Di-n-butyl phthalate	µg/kg	<460	<110	<270	<190	<70	<80
Di-n-octyl phthalate	µg/kg	<460	<110	140	<190	<70	<80
Dibenz(a,h)anthracene	µg/kg	<92	8.1	<55	6.8	<14	<16
Dibenzofuran	µg/kg	<460	<110	<270	<190	<70	<80
Diethyl phthalate	µg/kg	<460	<110	<270	<190	<70	<80
Dimethyl phthalate	µg/kg	<460	<110	<270	<190	<70	<80
Fluoranthene	µg/kg	59	71	63	90	3	29

Table A-3. (Continued)

		Cell 2	Cell 2	Cell 2	Cell 2	Cell 3	Cell 3
Sample ID:		**INLET0318**	**INLET0324**	**INLET0419**	**INLET0517**	**INLET0422**	**INLET0504**
Laboratory ID:		**C0C190561001**	**C0C250608001**	**C0D200483001**	**C0E180468001**	**C0D230556001**	**C0E060550001**
Sample Date:		3/18/2010	3/24/2010	4/19/2010	5/17/2010	4/22/2010	5/4/2010
Fluorene	µg/kg	<92	<22	<55	16	<14	<16
Hexachlorobenzene	µg/kg	<92	<22	<55	<38	<14	<16
Hexachlorobutadiene	µg/kg	<92	<22	<55	<38	<14	<16
Hexachlorocyclopentadiene	µg/kg	<460	<110	<270	<190	<70	<80
Hexachloroethane	µg/kg	<460	<110	<270	<190	<70	<80
Indeno(1,2,3-cd)pyrene	µg/kg	<92	26	29	30	<14	8.1
Isophorone	µg/kg	<460	<110	<270	<190	<70	<80
N-Nitrosodi-n-propylamine	µg/kg	<92	<22	<55	<38	<14	<16
N-Nitrosodimethylamine	µg/kg	<92	<22	<55	<38	<14	11
N-Nitrosodiphenylamine	µg/kg	<92	<22	<55	<38	<14	<16
Naphthalene	µg/kg	<92	23	18	33	<14	6.3
Nitrobenzene	µg/kg	<92	<22	<55	<38	<14	<16
Pentachlorophenol	µg/kg	<460	<110	<270	<190	<70	<80
Phenanthrene	µg/kg	43	42	37	61	3.1	16
Phenol	µg/kg	20	<22	<55	<38	<14	10
Pyrene	µg/kg	64	61	55	65	3.1	23

APPENDIX B

PULLEN AND CHARLESTON DREDGING LOGS

Table B-1. Dredging logs for the dredge boat Pullen recorded during Reach C deepening in spring of 2010

Date	Dredge Location	Dredging Time		Dredged	Sediment Type
		Hours	Minutes	Quantity (cy)	
3/1-3/2/2010	N/A	N/A	N/A	10222	N/A
3/3/2010	STA 233+775 to STA 234+000	22	5	10889	100% silt, trace sand
3/9/2010	STA 231+000 to STA 231+140	7	5	2074	100% silt, trace sand
3/10/2010	STA 231+140 to STA 231+665	20	0	14778	100% silt, trace sand
3/11/2010	STA 231+665 to STA 232+225	21	5	33185	100% silt, trace sand
3/12/2010	STA 232+225 to STA 232+910	20	35	40593	100% silt, trace sand
3/13/2010	STA 232+910 to STA 233+310	14	40	23704	100% silt, trace sand
3/14/2010	STA 233+310 to STA 233+775	21	10	20667	100% silt, trace sand
3/15/2010	STA 233+775 to STA 234+000	16	5	10000	100% silt, trace sand
3/16/2010	STA 231+960 to STA 232+500	20	40	3185	100% silt, trace sand
3/17/2010	STA 233+215 to STA 233+500	16	50	12444	100% silt, trace sand
3/18/2010	STA 228+185 to STA 228+620	20	10	19333	100% silt, trace sand
3/19/2010	STA 228+620 to STA 229+115	20	10	22000	100% silt, trace sand
3/20/2010	STA 229+115 to STA 229+600	21	30	21556	100% silt, trace sand
3/21/2010	STA 229+600 to STA230+045	19	15	19778	100% silt, trace sand
3/22/2010	STA 230+045 to STA 230+140	5	55	4222	100% silt, trace sand
3/23/2010	STA 230+140 to STA 230+300	7	25	7111	100% silt, trace sand
3/24/2010	STA 230+300 to STA 230760	21	20	20444	100% silt, trace sand
3/25/2010	STA 230+760 to STA 231+000	17	30	16178	100% silt, trace sand
3/26/2010	STA 226+060 to STA 226+225	13	0	9778	80% silt, 15% sand, 15% gravel
3/27/2010	STA 226+225 to STA 226+535	21	55	11941	60% silt, 35% sand, 5% gravel
3/28/2010	STA 226+535 to STA 226+710	12	50	8296	60% silt, 40% sand, trace gravel
3/29/2010	STA 226+710 to STA 226+990	N/A	N/A	N/A	N/A
3/30/2010	STA 226+990 to STA 227+375	20	10	17111	70% silt, 30% sand, trace gravel
3/31/2010	STA 227+375 to STA 227+765	20	50	19067	95% silt, 5% sand
4/1/2010	STA 227+765 to STA 228+000	17	55	13034	95% silt, 5% sand
4/2/2010	STA 226+170 to STA 226+425	16	15	5237	95% silt, 5% sand
4/3/2010	STA 227+315 to STA 227+480	11	5	4711	100% silt, trace sand
4/4/2010	STA 226+090 to STA 226+290	20	50	6519	100% silt, trace sand
4/5/2010	STA 226+290 to STA 226+455	16	45	6844	silt, sand, gravel
4/13/2010	STA 230+920 to STA 231+000	16	55	15037	100% silt, trace sand and gravel
4/14/2010	STA 228+290 to STA 228+520	6	55	11926	100% silt, trace sand and gravel

Table B-1. (Continued)

Date	Dredge Location	Dredging Time		Dredged	Sediment Type
		Hours	Minutes	Quantity (cy)	
4/15/2010	STA 228+520 to STA	N/A	N/A	N/A	100% silt, trace sand
4/16/2010	STA 228+500 to STA 228+525	0	50	1407	100% silt, trace sand
4/17/2010	STA 228+525 to STA 229+100	19	55	29815	100% silt, trace sand
4/18/2010	STA 229+100 to STA 229+575	16	50	24630	100% silt, trace sand
4/19/2010	STA 229+575 to STA 230+165	21	30	32341	60% silt, 40% sand, trace gravel
4/20/2010	STA 230+165 to STA 230+670	17	0	26185	90% silt, 10% sand, trace gravel
4/21/2010	STA 230+670 to STA 231+000	18	55	18305	90% silt, 10% sand, trace gravel
4/22/2010	STA 230+040 to STA 230+350	21	20	5259	90% silt, 10% sand, trace gravel
4/23/2010	STA 231+210 to STA 231+600	22	0	8163	100% silt, trace sand
4/24/2010	STA 231+145 to STA 231+575	20	15	23570	100% silt, trace sand
4/25/2010	STA 231+575 to STA 231+600	21	40	1370	100% silt, trace sand
4/30/2010	STA 233+760 to STA 234+000	18	25	8296	100% silt, trace sand
5/1/2010	STA 231+740 to STA 232+215	21	55	26741	100% silt, trace sand
5/2/2010	STA 232+215 to STA 232+785	21	40	32089	100% silt, trace sand
5/3/2010	STA 232+785 to STA 233+470	22	15	30444	100% silt, trace sand
5/4/2010	STA 233+470 to STA 234+000	20	55	27481	100% silt, trace sand
5/5/2010	STA 234+000 to STA 234+045	18	0	12022	100% silt, trace sand
5/6/2010	STA 234+155 to STA 234+575	20	45	21778	80% silt, 20% fine sand, trace soft clay
5/7/2010	STA 234+575 to STA 235+025	20	55	18000	70% silt, 30% sand, trace soft clay
5/8/2010	STA 235+023 to STA 235+475	19	30	8705	60% silt, sand, trace soft clay
5/9/2010	STA 235+475 to STA 235+800	20	5	4770	70% silt, 30% sand, trace soft clay
5/10/2010	STA 235+975 to STA 236+200	7	35	5625	70% silt, trace sand
5/11/2010	STA 238+570 to STA 238+780	5	15	657	90% silt, 10% fine sand
5/12/2010	STA 238+780 to STA 239+345	18	30	10550	90% silt, 10% sand
5/13/2010	STA 239+345 to STA 239+500	7	25	314	90% silt, 10% sand
5/14/2010	N/A	N/A	N/A	N/A	100% silt, trace sand
5/15/2010	STA 234+000 to STA 234+195	11	20	8089	100% silt, trace sand
5/16/2010	STA 234+195 to STA 234+545	18	5	15556	80% silt, 20% sand
5/17/2010	STA 234+545 to STA 234+890	17	20	16867	100% silt, trace sand
5/18/2010	STA 234+890 to STA 235+200	21	5	14696	100% silt, trace sand
5/19/2010	STA 235+200 to STA 235+510	18	20	12400	100% silt, trace sand
5/20/2010	STA 235+510 to STA 235+785	17	25	9778	100% silt, trace sand

Table B-1. (Continued)

Date	Dredge Location	Dredging Time		Dredged	Sediment Type
		Hours	Minutes	Quantity (cy)	
5/21/2010	STA 235+785 to STA 235+845	7	30	5265	100% silt, trace sand
5/22/2010	STA 235+090 to STA 235+680	16	25	10773	80% fine sand and 20% silt
5/23/2010	STA 235+680 to STA 235+850	17	55	12624	80% fine sand and 20% silt
5/24/2010	STA 236+095 to STA 236+385	19	0	6119	20% silt, 80% fine sand
5/25/2010	STA 235+840 to STA 236+295	18	35	18840	90% fine sand, 10% silt, trace gravel
5/26/2010	STA 236+295 toSTA 236+400	15	40	4761	80% fine sand and 20% silt, trace gravel
5/27/2010	STA 236+400 to STA 236+755	17	20	13806	90% fine sand, 10% silt, trace gravel
5/28/2010	STA 236+755 to STA 237+045	15	15	6606	90% fine sand, 10% silt, trace gravel
5/29/2010	STA 237+045 to STA 237+360	16	55	7062	90% fine sand, 10% silt, trace gravel, trace soft clay
5/30/2010	STA 237+360 to STA 237+800	20	55	6844	90% fine sand, 10% silt, trace gravel, trace soft clay
5/31/2010	STA 237+800 to STA 238+300	17	35	3504	90% fine sand, 10% silt, trace gravel
6/1/2010	STA 236+085 to STA 236+220	20	15	2233	90% fine sand, 10% silt, trace gravel
6/2/2010	STA 236+700 to STA 237+000	14	35	2573	90% fine sand, 10% silt, trace gravel
6/3/2010	STA 234+335 to STA 234+530	5	40	188	90% fine sand, 10% silt, trace gravel
6/4/2010	STA 238+400 to STA 239+000	11	0	N/A	90% fine sand, 10% silt, trace gravel
6/5/2010	STA 239+000 to STA 239+655	10	45	N/A	90% fine sand, 10% silt, trace gravel
6/6/2010	N/A	N/A	N/A	N/A	90% fine sand, 10% silt, trace gravel
6/7/2010	N/A	N/A	N/A	N/A	90% fine sand, 10% silt, trace gravel
6/8/2010	N/A	N/A	N/A	N/A	90% fine sand, 10% silt, trace gravel
6/9/2010	N/A	N/A	N/A	N/A	90% fine sand, 10% silt, trace gravel
6/10/2010	STA 206+200 to STA 205+965	5	40	6223	50% fine sand, 50% silt, trave gravel
6/11/2010	STA 205+965 to STA 205+495	20	45	15144	100% silt, trace fine sand
6/12/2010	STA 205+495 to STA 205+050	21	45	19036	100% silt, trace fine sand
6/13/2010	STA 205+050 to STA 204+770	16	45	15307	90% fine sand, 10% silt, trace gravel
6/14/2010	STA 204+770 to STA 204+610	15	50	14314	100% silt, trace gravel
6/15/2010	STA 204+555 to STA 204+140	22	5	25838	100% silt, gravel and soft clay

Table B-2. Dredging logs for the dredge boat Charleston recorded during Reach C deepening in spring of 2010

Date	Dredge Location	Dredging Time		Dredged	Sediment Type
		Hours	Minutes	Quantity (cy)	
4/18/2010	STA 216+180 to STA 216+270	N/A	N/A	609	10% mud, 45% gravel, 45% rock
4/19/2010	STA 216+235 to STA 216+255	N/A	N/A	3872	10% mud, 45% gravel, 45% rock
4/20/2010	STA 216+615 to STA 216+830	N/A	N/A	4459	10% mud, 45% gravel, 45% rock
4/21/2010	STA 216+830 to STA 217+040	N/A	N/A	3733	10% mud, 45% gravel, 45% rock
4/22/2010	STA 217+040 to STA 217+325	15	55	5489	N/A
4/23/2010	STA 217+325 to STA 217+735	20	25	7289	N/A
4/24/2010	STA 217+735 to STA 217+840	12	15	1867	N/A
4/25/2010	STA 217+840 to STA 218+045	13	40	3341	N/A
4/26/2010	STA 218+045 to STA 218+290	19	30	3267	N/A
4/27/2010	STA 218+290 to STA 218+395	7	0	2333	N/A
4/28/2010	STA 218+395 to STA 218+785	20	55	15022	N/A
4/29/2010	STA 218+785 to STA 219+000	15	40	6022	N/A
4/30/2010	STA 219+060 to STA 219+590	20	35	11307	N/A
5/1/2010	STA 219+590 to STA 220+040	N/A	N/A	N/A	N/A
5/2/2010	STA 220+040 to STA 220+440	17	35	12444	N/A
5/3/2010	STA 220+440 to STA 220+705	16	20	8244	N/A
5/4/2010	STA 220+705 to STA 221+050	20	25	10733	N/A
5/5/2010	STA 221+050 to STA 221+320	N/A	N/A	N/A	N/A
5/6/2010	STA 221+320 to STA 221+770	21	35	6900	N/A
5/7/2010	STA 221+770 to STA 222+000	18	0	5179	N/A
5/8/2010	STA 224+065 to STA 224+450	14	10	5669	N/A
5/9/2010	STA 224+450 to STA 224+530	2	35	1041	N/A
5/10/2010	STA 224+535 to STA 224+660	13	0	3772	N/A
5/11/2010	STA 225+715 to STA 226+000	15	5	2356	N/A
5/12/2010	STA 217+110 to STA 217+325	15	15	231	N/A
5/13/2010	STA 217+570 to STA 217+680	13	55	408	N/A
5/14/2010	STA 218+875 to STA 218+875	9	30	N/A	N/A
5/15/2010	STA 218+875 to STA 219+000	5	0	N/A	N/A
5/16/2010	STA 214+360 to STA 214+870	18	25	2763	N/A
5/17/2010	STA 214+870 to STA 214+980	6	45	1161	N/A
5/19/2010	STA 214+490 to STA 215+780	19	30	5098	N/A
5/20/2010	STA 215+510 to STA 215+850	18	25	4015	N/A

Table B-2. (Continued)

Date	Dredge Location	Dredging Time		Dredged	Sediment Type
		Hours	Minutes	Quantity (cy)	
5/21/2010	STA 213+840 to STA 213+840	18	20	5303	N/A
5/22/2010	STA 213+470 to STA 213+025	21	5	4399	N/A
5/23/2010	STA 212+805 to STA 212+295	20	20	5163	N/A
5/24/2010	STA 214+010 to STA 213+360	20	15	10546	N/A
5/25/2010	STA 213+360 to STA 212+960	15	25	9289	N/A
5/26/2010	STA 212+960 to STA 212+170	19	40	8519	N/A
5/27/2010	STA 212+170 to STA 212+100	19	10	5071	N/A
5/28/2010	STA 212+100 to STA 211+930	21	30	5981	N/A
5/29/2010	STA 212+930 to STA 211+690	21	50	10200	N/A
5/30/2010	STA 211+690 to STA 211+460	20	40	9992	N/A
5/31/2010	STA 211+460 to STA 211+275	20	25	10175	N/A
6/1/2010	STA 211+275 to STA 211+225	17	5	8379	N/A
6/2/2010	STA 211+000 to STA 210+855	16	5	9711	N/A
6/3/2010	STA 211+060 to STA 210+750	21	50	9254	N/A
6/4/2010	STA 210+750 to STA 210+565	19	35	8784	N/A
6/5/2010	STA 210+740 to STA 210+645	N/A	N/A	4085	10% mud, 60% fine sand, 25% gravel, 5% rock
6/6/2010	STA 210+645 to STA 210+400	N/A	N/A	11760	10% mud, 60% fine sand, 25% gravel, 5% rock
6/7/2010	STA 210+400 to STA 210+275	21	10	8470	N/A
6/8/2010	STA 210+310 to STA 210+175	21	45	11134	N/A
6/9/2010	STA 210+075 to STA 209+895	22	15	9507	N/A
6/10/2010	STA 209+895 to STA 209+690	22	15	13782	N/A
6/11/2010	STA 209+620 to STA 209+167	21	40	12716	N/A
6/12/2010	STA 208+910 to STA 208+595	21	30	16641	N/A
6/13/2010	STA 208+595 to STA 208+215	22	15	15664	N/A
6/14/2010	STA 208+215 to STA 207+785	21	50	16712	N/A
6/15/2010	STA 207+785 to STA 207+455	17	25	10325	N/A
6/16/2010	STA 207+455 to STA 206+680	22	20	11393	N/A

DELAWARE RIVER PHILADELPHIA TO THE SEA
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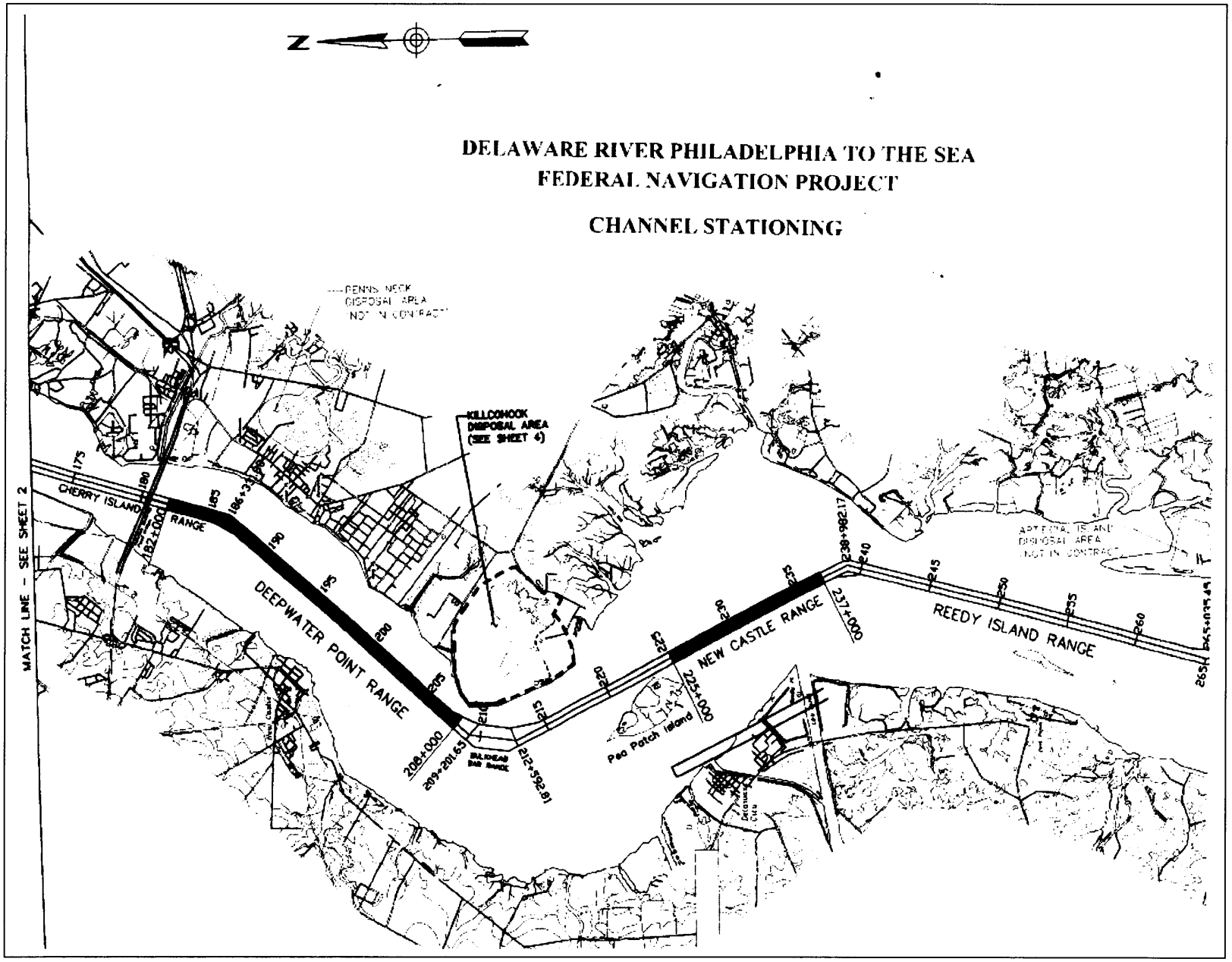
CHANNEL STATIONING