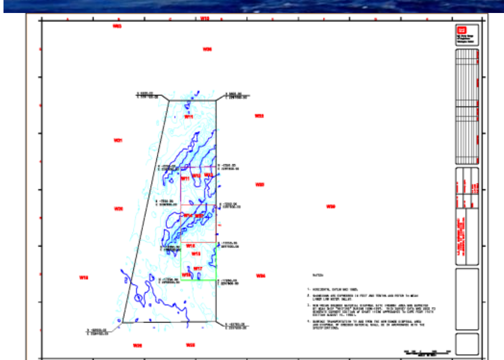
United States
Environmental Protection
Agency

Water Protection Division
Wetlands & Marine Regulatory Section
Atlanta, GA

September, 2010

New Wilmington ODMDS Status and Trends
May 2010



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ACKNOWLEDGEMENTS

Samples were collected May 10 - 11, 2010 from the New Wilmington Ocean Dredged Material Disposal Site (ODMDS) and the surrounding environs [Gary W. Collins, Chief Scientist]. Philip Payonk and Morris Flexner jointly served as Principal Investigators. Coordination of sediment samples for macroinvertebrate analysis was handled by Don Norris, while Doug Johnson performed the same role for chemical analysis; water samples were coordinated by Megan Holton. Sample tracking, chain of custody and QA/QC adherence were performed by Phyllis Meyer. Drew Kendall led deck operations while Rosemary Hall kept careful data records of all survey activity. Invaluable assistance was provided by Captain Doug Brown and the entire crew of the Ocean Survey Vessel (OSV) Bold.

Appropriate Citation:
U.S. EPA. 2010. **New Wilmington ODMDS - Status and Trends, May 2010.** U.S. Environmental Protection Agency, Region 4, Water Protection Division, Wetlands, Coastal & Oceans Branch, Wetlands & Marine Regulatory Section, SNAFC, 61 Forsyth St. SW, Atlanta, GA 30303.

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INTRODUCTION

Ocean disposal of dredged materials can affect the environment of a disposal site by disturbing the benthic community and potentially causing long-term reduction of oxygen in the pore waters of the sediments and the overlying waters. Natural oceanographic processes can also be responsible for transporting disposed materials offsite into nearby habitats.

As part of the U. S. Environmental Protection Agency (USEPA), Region 4's strategy to monitor the effects of dredged material disposal within the marine environment, routine surveys of the benthos and water column within and adjacent to our sites are conducted so that their status may be assessed. In addition, the data is archived so that over time, trends which may occur can be observed. These status and trends surveys are consistent with the requirements of 40 C.F.R. 228.9. The present study being discussed was conducted aboard the Ocean Survey Vessel (OSV) Bold on May 10-11, 2010.

BACKGROUND

The original Wilmington ODMDS was designated by the USEPA in August 1987. For many years the site received both new work and maintenance material from the Federally-authorized navigation channels of the Cape Fear River basin. In addition, new work and routine maintenance of the Military Ocean Terminal, Sunny Point (MOTSU) has utilized ocean dumping to satisfy disposal needs.

During the mid 1990's, the U. S. Army Corps of Engineers (USACE) determined the need for a site with more capacity and out of the path of the required newly-aligned entrance channel for the upcoming deepening project for the federal project. Beginning in 1998, the USEPA and USACE went about the process of finding a suitable ODMDS to replace the site currently being used.

The process to identify, characterize and designate a new ODMDS that would replace the original site was completed in 2002. The Final Rule promulgated to designate the New Wilmington ODMDS went into effect in August of that year. Use of the original Wilmington ODMDS was halted shortly thereafter.

As part of the designation process, a Site Management and Monitoring Plan (SMMP) was developed for the New Wilmington ODMDS in 2002. Annual bathymetry surveys have been conducted at the site by the Corps of Engineers. This monitoring effort is the first opportunity to look at the potential impacts to the biological communities by dredging activities. The data from the site characterization work used as part of the site designation process is the only data to address overall changes to the benthos over time (USACE, 1999).

SURVEY AREA AND LOCATION

The study area is within and surrounding the New Wilmington, NC ODMDS located offshore Bald Head and Oak Islands. The ODMDS is approximately 12.3 square nautical miles (nmi) in area. Sixteen stations were selected in order to analyze the sediment grain size, chemical, and biological characteristics of areas inside the ODMDS where disposal has occurred, and outside the ODMDS. In addition, three (3) stations were selected to receive water quality sampling. Depths in this area ranged from 38 to 52 feet. The ODMDS boundary corner coordinates (NAD 27) are:

33°46'N 78°02.5'W
33°46'N 78°01.0'W
33°41'N 78°01.0'W
33°41'N 78°04.0'W

The ODMDS, survey area and station locations are shown in Figure 1.

METHODS AND MATERIALS

Method Rationale: Characterization of the benthic community and sediment size/chemistry at selected stations, followed by analysis of community parameters via statistical treatment, allows for identification and interpretation of changes in the community structure. Such community statistics can be used to draw inferences regarding perturbations to the benthic macroinvertebrate community and subsequently allow for judgments regarding the likelihood of impact from dredged material disposal.

Sampling Stations

Sixteen stations (see Table 1 and Figure 1) were established in an attempt to adequately sample two separate treatment areas (eight stations/treatment). The area within the ODMDS used for disposal of dredged material was sampled as the first treatment, and three separate areas outside the site (eastern, southern and western) were sampled as the second treatment. Three stations were selected for water quality sampling (see Figure 1).

Water Quality

To characterize the general water quality associated with the New Wilmington ODMDS and the surrounding area, the following water column parameters were measured: conductivity, dissolved oxygen (DO), salinity, temperature, density, turbidity, and % light transmission (utilizing PAR). All measurements were collected utilizing a Sea-Bird SBE 9 CTD maintained aboard the OSV Bold. Data was post processed utilizing the Sea-Bird Data Processing Software.

Go Flow® bottles attached to the CTD/rosette frame were tripped approximately one to three meters above the bottom and one to two meters below the surface to obtain water samples for laboratory analyses. Once the rosette was back aboard the ship, the bottles were emptied directly into the appropriate sample containers, labeled, and refrigerated until demobilization. Processing and handling of water samples were according to established Region 4 protocols (USEPA, 2007a). Laboratory analyses of the water include nutrients, metals, PAHs, PCBs and pesticides.

Seafloor Sampling

Bottom sampling at all stations was accomplished by a minimum of two deployments of a Young grab (surface area = 0.04 m^2; depth of 10 cm) from the stern of the ship. After retrieval of the grab and confirmation of an adequate sample, the sediments were removed from the grab and placed into either a pre-cleaned glass pan or dumped directly into a stainless steel tray. The stainless steel tray was used for transfer of sediments that would be processed for benthic macroinvertebrate identification. The glass pan was transferred to the ship's wet lab for sediments that would be sub-sampled in order to obtain discrete samples for sediment particle size analyses and sediment chemical analyses. All sampling procedures and sample preservation for analyses were according to the SESD Standard Operating Procedures (SOP), (US EPA, 2007b).

The sampling device and handling/preservative protocol for each type of sample follows below:

Sediment Particle Size

After thorough mixing, quartering, and further mixing of the sediments in the glass pan, a 3/4-cup mixing cup was used to scoop out the appropriate amount of sediments needed for sediment particle size analysis. The subsamples were placed into whirl packs, labeled, and frozen for return to the lab.

Sediment texture is determined at half-phi intervals using the ASTM method D-422 to determine the silt-clay and sand content by combination of sieve analysis (for the +230 mesh [sand] fraction) and Boyocous (hydrometer) analysis for the –230 mesh [silt – clay] fraction and nested sieves for larger particle fractions. Texture parameters that are computed included percent gravel, sand, and silt /clay, median particle size, sorting coefficient and percent moisture.

Total organic carbon (TOC) content is measured using the standard gravimetric carbon analytical procedure carried out using a LECO induction furnace (ASTM method E-354-97).

Sediment Chemistry

Sediment chemistry analyses were not conducted at each individual station sampled as part of this study. Sediments from a varying number of stations were composited for further analyses, allowing for results to be viewed on a zoned basis. In addition, the use of composited samples allowed the study to reduce the number of samples sent back to the laboratory without the need for excluding any part of the vast study area. Station ID's W30 – W34 were used to identify the composited sediments for laboratory analyses (see Table 2). After removal of the sediment particle size sample, the remainder of the sample was left in the pan and covered with aluminum foil. Upon completion of sample collection at all the stations that made up each composite, the sediments were placed into the same pan and thoroughly mixed before transfer to the approximate sample containers.

The sample was transferred to a glass pan and thoroughly mixed. The sample was alloquated into two 236.6 ml. glass containers and preserved by storing at 4^{o} C until analyzed. One container was analyzed for extractable organic compounds and the other was analyzed for metals. Analyses for the following parameters were conducted at the SESD lab in Athens, Georgia: heavy metals scan, extractable organic compounds (PAH's, pesticides, and PCBs).

Benthic Macroinvertebrate Infauna

Sediments from a separate deployment of the grab were collected to obtain benthic macroinvertebrate organisms. On-board processing involved washing the sample through a #35 screen (0.5mm). The sample retained on the screen after washing was preserved with 100 % NoToXhisto®. Benthic containers were labeled both internally and externally and stored for transfer to contract lab facilities. The details of sorting and identification of infaunal taxa, as well as discussions of statistical analyses of the data, are described in Vittor, 2010.

RESULTS AND DISCUSSION

Water Quality

The results of the water quality profiles are summarized in Table 3, and visually demonstrated by Figures 2 and 3. All stations sampled showed the absence of any layering, revealing that the water column throughout the entire study area was extremely well-mixed.

Temperatures recorded ranged from 20.66 to 21.02 ºC, while salinity ranged from 33.92 to 34.49 ppt (see Table 3, Figure 2).

Dissolved oxygen (DO) readings, ranging from 6.84 to 7.04 mg/L, also showed the presence of well-mixed waters (see Table 3, Figure 3).

The results from chemical analyses of the water samples collected during this study are provided in Appendix D (Tables D4 through D7). With the exception of iron, all other analytes were either not detected at or above the reporting limit or the reported values were flagged as estimates. Reported values for iron ranged from 2200 to 2400 ug/L, and are not at levels that would cause concern.

Seafloor Sampling

After completing the bottom sampling at stations W11 and W12, it was noted that disposal operations from the Military Ocean Terminal, Sunny Point (MOTSU) was still ongoing. As a matter of fact, the sediments we had obtained were probably dumped within a couple of days at the most. Although it was our intention to sample from recently dumped dredged material, we did not want the material before enough time had elapsed to allow for the benthic community to recover and establish equilibrium. Even the earliest colonization of these sediments did not have sufficient time to occur. The short-term impacts due to dredged material disposal has been well documented and was not one of our objectives in this study. Therefore, all sediment data from stations W11 and W12 will be excluded from our discussions. The data for these stations are being included in Appendices B, C and E.

Sediment Particle Size

The results of the sediment particle size analyses are given in Table 4 and shown by Figure 4. All stations were shown to be predominantly sand with mean values of 98.42 % found inside the ODMDS and 97.12 % found outside the ODMDS. The highest reported value for the silt/clay fraction at any station was less than 5 %.

Sediment Chemistry

The sediment chemistry showed all contaminants except for metals, to be at or below detection limits. For the fourteen metals analyzed for, nine were detected although copper was only detectable in only one of the five composites.

Results of metals analyses for the sediments are summarized in Table 5. As the summarized data shows, all metals showed higher averaged values for the composites taken from inside the ODMDS than those taken from outside the ODMDS. The reported values for each of the individual composites are found in Table C1. A comparison of values across the five composites shows that for most metals, W30 has a substantially higher value than the other four composites. In fact, the other four composites seem to have very similar values to one another.

Despite the fact that the data from stations W11 and W12 have been excluded from discussion where feasible, the fact remains that sediments from both these stations are half the volume of composite W30. A review of the particle size data for these stations shows that these stations had a silt/clay fraction of from 53 % to 70 %. Compared to the 0.2 % to 4.9 % found at all other stations, it becomes apparent that contaminants of concern have a greater chance for adsorption within the sediments at the two excluded stations. If the opportunity had been available to chemically analyze all the stations individually rather than compositing them, it is likely that the higher levels would only have been seen at these two stations.

Due to the fact that none of the reported values seen at any of the five composite stations are elevated to levels of concern, further sampling to verify the above suppositions are not warranted.

Benthic Macroinvertebrate Infauna

The benthic infauna data is detailed and summarized in "Wilmington, North Carolina 2010 ODMDS Status and Trends Benthic Community Assessment " (Vittor, 2010). The data from the stations collected inside the ODMDS showed the bivalve *Petricola pholadiformis* to be the dominate taxon, representing 25.3% of the total number of individuals. Other dominant taxa included the amphipod, *Erichthonius brasiliensis*, the isopod, *Edotia triloba*, and the polychaete Family, Maldanidae (LPIL), representing 7.8%, 7.3%, and 5.0% of the total assemblage, respectively.

The dominant taxon collected from outside the ODMDS was the polychaete Family, Capitellidae (LPIL), representing 8.7% of the total number of individuals. Other dominant taxa included the polychaete, *Mediomastus* (LPIL), and the amphipods, *Ampelisca macrocephala*, *Oxyurostylis smithi*, and *Protohaustorius wigleyi*, representing 7.3%, 6.3%, 5.7% and 5.1% of the total assemblage, respectively.

Taxa richness and density data for stations inside and outside the ODMDS are given in Table 6, and summarized in Table 7. For stations inside the ODMDS, taxa richness averaged 25.5 taxa/station (SD = 6.2), and densities averaged 2729.2 organisms/m^2 (SD = 2382.7). For stations outside the ODMDS, taxa richness averaged 31.1 taxa/station (SD = 9.9), and densities averaged 2371.9 organisms/m^2 (SD = 862.1). Statistical analyses showed that there was no significant difference between stations inside and outside the ODMDS in either taxa richness or density (see Vittor, 2010).

Taxa diversity (H') and taxa evenness (J') for stations inside and outside the ODMDS are given in Table 6, and summarized in Table 7. Taxa diversity averaged 2.56 (SD = 0.41) inside the site, and 2.83 (SD = 0.38) at those stations outside the site. Taxa evenness inside the site averaged 0.80 (SD = 0.16), while outside the site averaged 0.83 (SD = 0.06).

The results of cluster, MDS, ANOSIM and SIMPLER analyses are discussed in detail within Vittor, 2010. The results of both cluster and MDS analyses showed that the 14 stations fell into one of three major groups. These data indicate that there were appreciable differences in the macroinvertebrate assemblages between stations inside and outside the ODMDS. ANOSIM and SIMPLER analyses also showed a significant difference between the assemblages found inside the ODMDS and those outside the ODMDS.

The fact that Cluster, MDS, ANOSIM and SIMPLER analyses indicate that significant differences are seen between stations inside the site and those outside the site is not alarming when one considers what aspect of the data these analyses look at. These analyses specifically look for differences in the taxonomic makeup of each treatment. The simple fact that stations inside the ODMDS have a different taxonomic community from the stations outside the ODMDS does not mean that either one is better, or preferred, than the other one. The statistical parameters (i.e., taxa richness, density) showed that, statistically speaking, stations inside the site are just as diverse and rich as those outside the site. If these parameters indicated that communities inside the site were statistically lower than outside the site, a sufficient level of concern would be indicated. In such a case, a more robust study with significantly increased numbers of replicates for both treatments would be recommended.

CONCLUSIONS

The benthic environment of the New Wilmington ODMDS, as well as that found just outside the site, was sampled in order to determine its status and hopefully identify possible trends. While the present study design will not allow for any type of rigorous impact assessment, it was designed to highlight indicators which would show whether or not a more detailed, concentrated effort is needed.

The various parameters analyzed through this effort all indicate that, while some significant differences were found when comparing the taxanomic make-up of the actively-used part of the site to that which has never been used, there were no discernable differences when comparing community statistical parameters.

In conclusion, the data collected in May 2010 shows that the benthic community of the New Wilmington ODMDS is viable, healthy and showing no indication that any type of adverse impact has occurred due to the dumping of dredged material.

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Table 1. New Wilmington ODMDS Status and Trends Stations – May 2010.

Station ID	Latitude(N) (Degrees, minutes)	Longitude(W) (Degrees, minutes)	Depth(m)	Young Grabs(y/n)	CTD Casts(y/n)
W11	33° 44.15′	78° 02.07′	13.0	y	n
W12	33° 44.20′	78° 01.78′	12.4	y	n
W13	33° 44.21′	78° 01.41′	14.1	y	n
W14	33° 43.32′	78° 02.01′	14.1	y	n
W15	33° 42.69′	78° 02.01′	15.0	y	n
W16	33° 42.53′	78° 01.81′	13.6	y	n
W17	33° 42.20′	78° 01.80′	13.2	y	n
W18	33° 42.04′	78° 02.08′	13.5	y	n
W19	33° 42.03′	78° 05.01′	16.4	y	n
W20	33° 43.50′	78° 03.97′	15.6	y	n
W21	33° 45.00′	78° 04.03′	15.6	y	n
W22	33° 45.51′	77° 59.98′	14.2	y	n
W23	33° 43.99′	77° 59.98′	13.4	y	n
W24	33° 42.00′	77° 59.98′	14.2	y	n
W25	33° 40.50′	78° 01.98′	15.0	y	n
W26**	33° 40.51′	78° 03.47′	15.3	y	n
W36	33° 47.64′	78° 01.49′	11.1	n	y
W37	33° 44.21′	78° 01.43′	13.1	n	y
W39	33° 43.53′	77° 57.91′	9.1	n	y

** station id's W30 through W34 were used to identify the chemistry composites (see Table 2)
Coordinates are a rough interpolation between the two coordinates of that station's grabs (see Table A2.)

Table 2. Station Groupings for Chemistry Composites.

Inside/Outside	Sample ID	Stations Used to Make up Composite
Inside	**W30**	11, 12, 13, 14
Inside	**W31**	15, 16, 17, 18
Outside	**W32**	19, 20
Outside	**W33**	21, 22, 23
Outside	**W34**	24, 25, 26

Table 3. New Wilmington ODMDS Water Quality Data – May 2010.

	W36	W37	W39
Conductivity (S/m)			
minimum	4.80	4.79	4.78
maximum	4.80	4.81	4.79
Density (kg/m3)			
minimum	23.903	24.077	23.886
maximum	23.907	24.212	23.892
Temperature ©			
minimum	21.00	20.66	20.92
maximum	21.02	20.87	20.95
Salinity (ppt)			
minimum	33.92	34.40	34.18
maximum	34.23	34.49	34.18
Diss. Oxy. (mg/L)			
minimum	6.92	6.95	6.84
maximum	6.97	7.04	6.90
Turbidity (ntu's)			
minimum	0.85	0.62	1.05
maximum	1.21	3.84	1.37

Table 4. New Wilmington ODMDS Sediment Particle Size – May 2010.

Sta. ID	% gravel	% sand	% silts	% clays	description
Inside the ODMDS					
W13	1.49	98.26	0.11	0.14	sand
W14	0.16	99.36	0.06	0.42	sand
W15	3.36	95.96	0.19	0.49	sand
W16	0.75	98.57	0.28	0.39	sand
W17	0.09	99.69	0.06	0.15	sand
W18	1.04	98.66	0.07	0.23	sand
Mean	**1.15**	**98.42**	**0.13**	**0.3**	
Outside the ODMDS					
W19	0.14	97.69	0.54	1.63	sand
W20	1.54	96.41	1.58	0.47	sand
W21	0.35	98.39	0.98	0.28	sand
W22	0.70	98.66	0.15	0.49	sand
W23	0.14	97.55	1.49	0.82	sand
W24	0.35	96.09	1.29	2.27	sand
W25	0.00	97.33	2.60	0.07	sand
W26	0.20	94.83	0.20	4.76	sand
Mean	**0.43**	**97.12**	**1.10**	**1.35**	

Table 5. Sediment Metals Analyses – New Wilmington ODMDS, May 2010.

	(concentrations are expressed as mg/kg)				
Aluminum	INSIDE	**1335**	Arsenic	INSIDE	**2.95**
	OUTSIDE	**756.7**		OUTSIDE	**2.50**
Chromium	INSIDE	**5.1**	Copper	INSIDE	**0.875**
	OUTSIDE	**5.8**		OUTSIDE	**0.500 u**
Iron	INSIDE	**4150**	Lead	INSIDE	**2.08**
	OUTSIDE	**2166.7**		OUTSIDE	**1.26**
Manganese	INSIDE	**72.5**	Nickel	INSIDE	**1.38**
	OUTSIDE	**27.3**		OUTSIDE	**0.97**
Zinc	INSIDE	**8.45**			
	OUTSIDE	**5.27**			

NOTE: Flag "u" denotes that analyte was not detected at or above the reporting limit.

Table 6. Infaunal Community Parameters – New Wilmington ODMDS, May 2010.

Station	Taxa Richness	Density	Diversity	Evenness
Inside the ODMDS				
W13	35	4100	3.75	0.73
W14	28	2050	4.05	0.84
W15	23	1425	3.92	0.87
W16	28	6950	2.51	0.52
W17	22	1025	4.12	0.92
W18	17	825	3.80	0.93
Mean	**25.5**	**2729.2**	**2.56**	**0.80**
Std. Dev.	**6.2**	**2382.7**	**0.41**	**0.16**
Outside the ODMDS				
W19	32	3125	3.95	0.79
W20	48	3900	4.61	0.83
W21	40	2300	4.78	0.90
W22	15	1250	3.27	0.84
W23	31	1525	4.64	0.94
W24	31	2450	4.00	0.81
W25	28	2575	3.63	0.76
W26	24	1850	3.74	0.82
Mean	**31.1**	**2371.9**	**2.83**	**0.83**
Std. Dev.	**9.9**	**862.1**	**0.38**	**0.06**

Table 7. Comparative Summary – New Wilmington ODMDS, May 2010.

	Inside (2010)	Outside (2010)	1998
Grain Size			
% gravel	1.15	0.43	n/a
% sand	98.42	97.12	92.5
% silt	0.13	1.10	7.5*
% clay	0.30	1.35	n/a
Sediment Chemistry			
Arsenic	2.95	2.5	1.99
Chromium	5.1	5.8	8.20
Copper	0.875	0.500 u	0.57
Lead	2.08	1.26	1.86
Manganese	72.5	27.3	34.29
Nickel	1.38	0.97	1.16
Zinc	8.45	5.27	5.79
Infaunal Community Parameters			
Total taxa	25.5	31.1	24.2
Mean density	2729.2	2371.9	2256.5
H’	2.56	2.83	3.3
J’	0.80	0.83	0.7
D	5.55	6.62	3.6

* - laser analyses in 1998 did not differentiate between silt and clay fractions

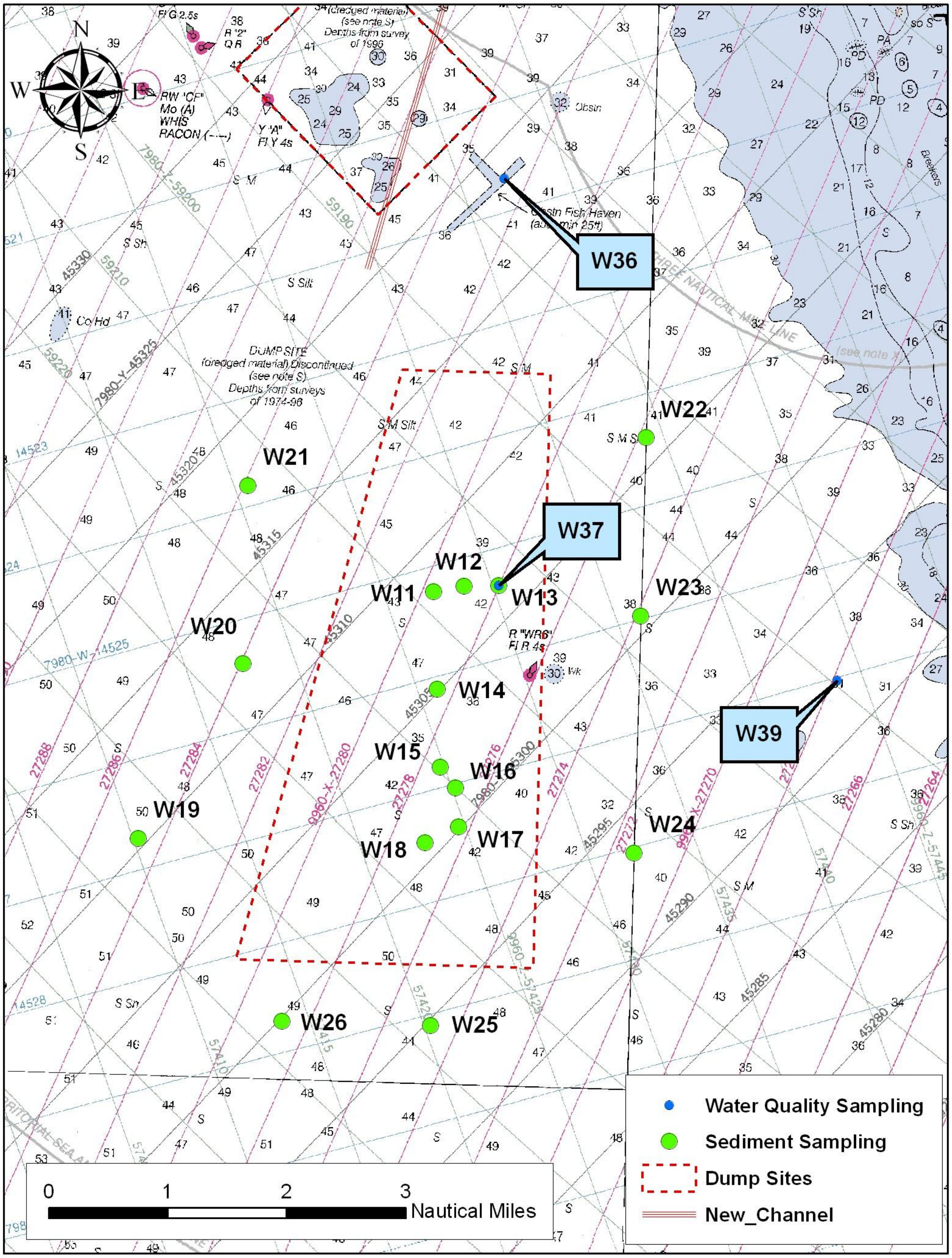
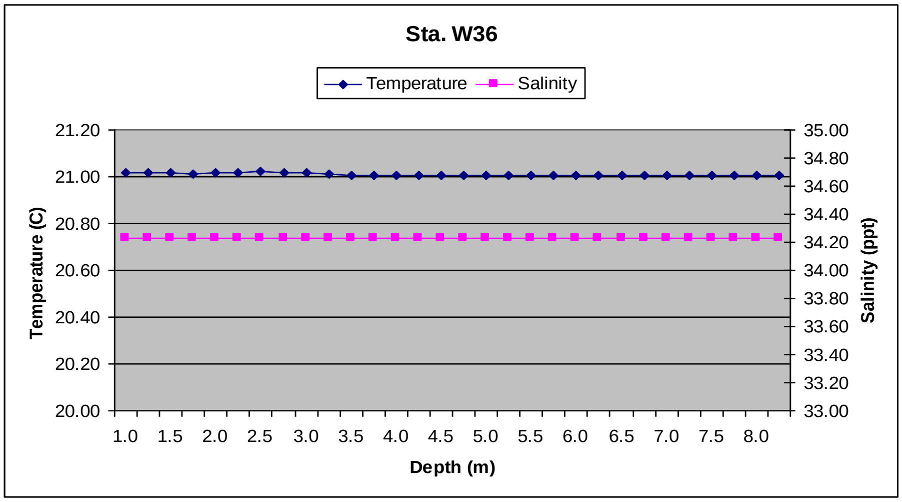
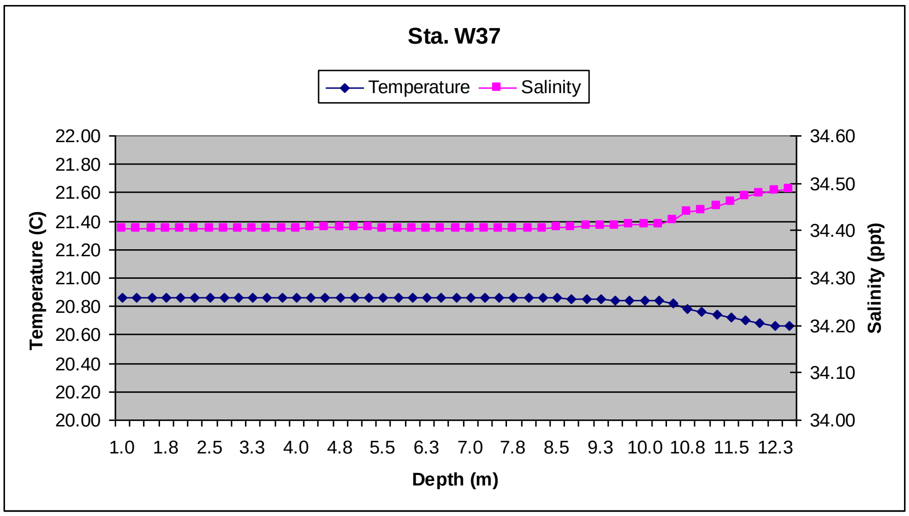


Figure 1. New Wilmington sample stations, May, 2010.





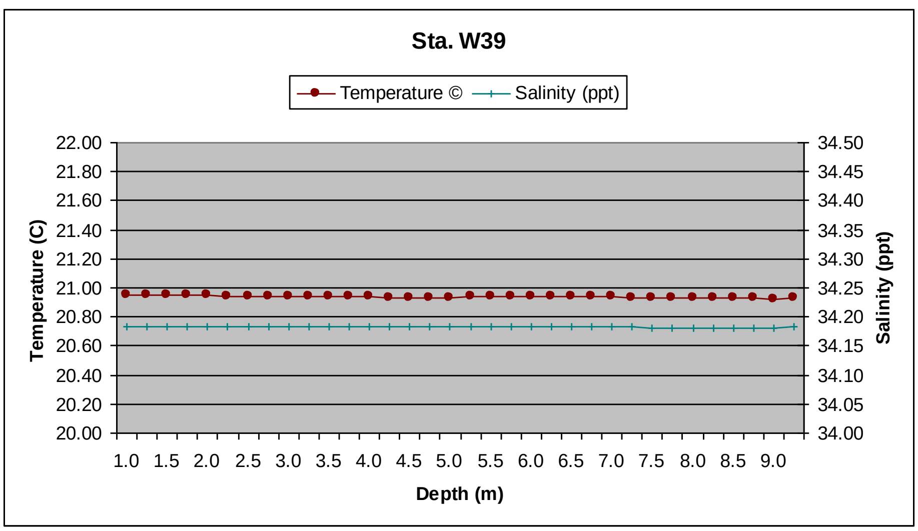


Figure 2. Temperature & Salinity, New Wilmington ODMDS, May 2010.

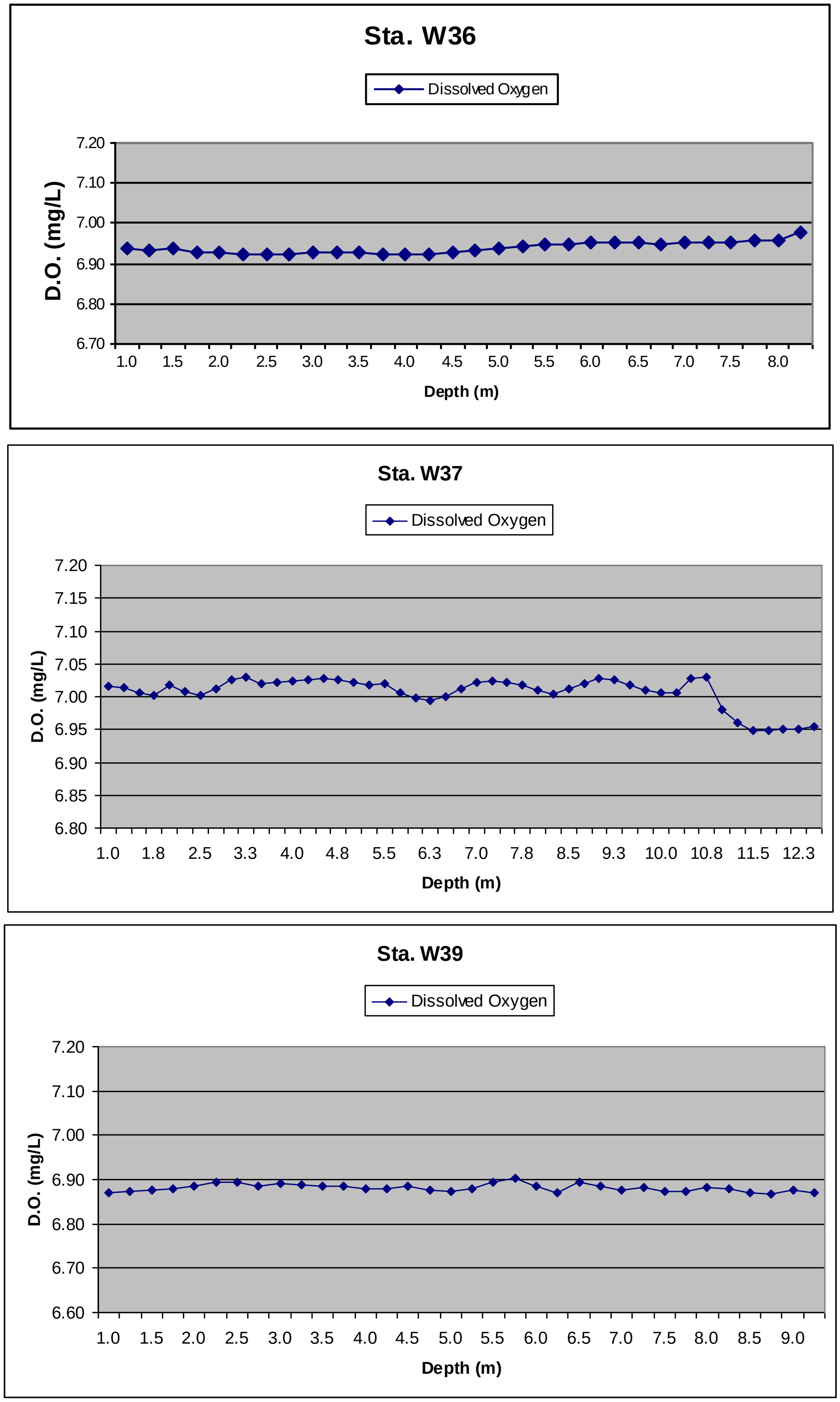


Figure 3. Dissolved Oxygen, New Wilmington ODMDS, May 2010.

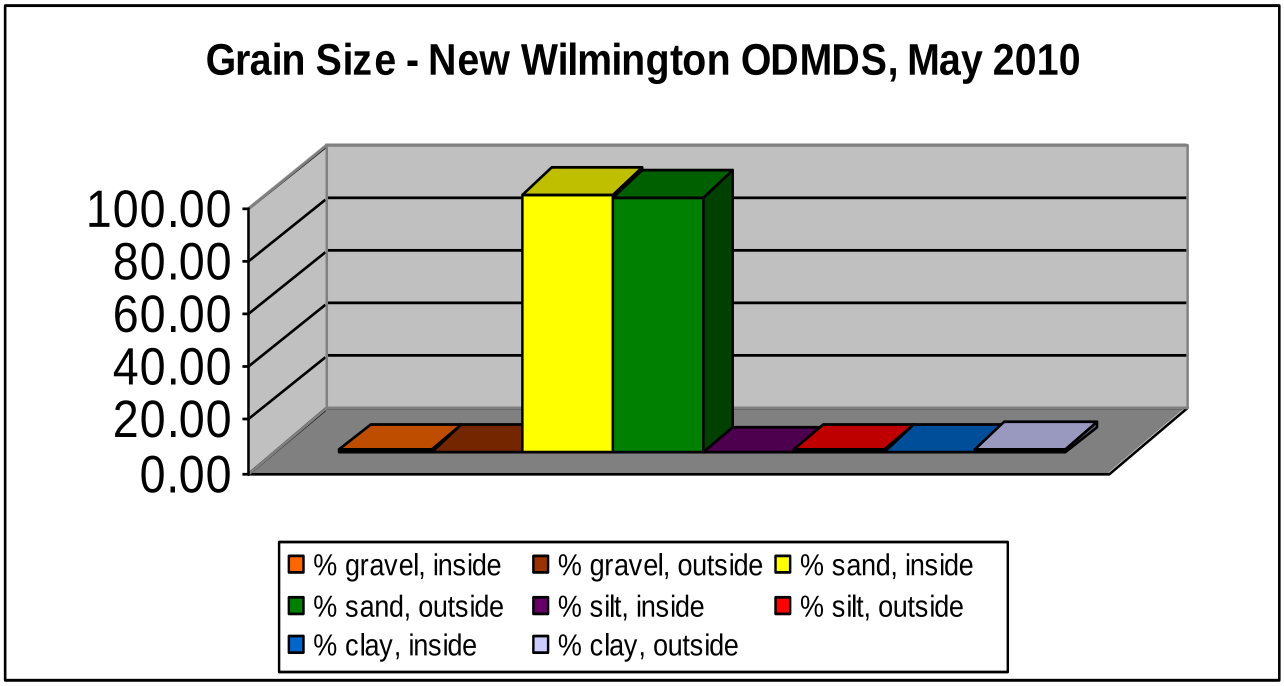


Figure 4. Grain Size, New Wilmington ODMDS, May 2010.

APPENDIX A

SURVEY METADATA

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Table A1. Scientific Party – New Wilmington ODMDS Status and Trends, May 2010.

Name	Survey Responsibility	Organization
Gary W Collins	Chief Scientist	EPA/R4/Atlanta
Morris Flexner	Principal Investigator	EPA/R4/Athens
Phyllis Meyer	Chain-of-custody	EPA/R4/Athens
Philip Payonk	Station Coordinator	USACE/Wilmington
Doug Johnson	Chemistry Coordinator	EPA/R4/Atlanta
Drew Kendall	Deck ops	EPA/R4/Atlanta
Rosemary Hall	Data Recorder	EPA/R4/Atlanta
Don Norris	Macroinvertebrate Coordinator	EPA/R4/Athens
Megan Holton	Sample Coordinator	EPA/R4/Athens

Table A2. Benthic Grabs.

Station ID	Drop #	Date	Time (24hr)	Depth (m)	Latitude [33o]	Longitude [78o]	Target Analysis
W11	1	05/10/10	1420	12.9	44.157	2.074	macroinvert
W11	2	05/10/10	1427	13.1	44.149	2.079	PSD/chem.
W12	1	05/10/10	1441	12.1	44.206	1.773	macroinvert
W12	2	05/10/10	1447	12.7	44.186	1.784	PSD/chem.
W13	1	05/10/10	1501	14.0	44.214	1.416	macroinvert
W13	2	05/10/10	1504	14.1	44.220	1.408	PSD/chem.
W14	1	05/10/10	1520	14.1	43.319	2.013	macroinvert
W14	2	05/10/10	1523	14.1	43.315	2.008	PSD/chem.
W15	1	05/10/10	1559	14.8	42.693	2.010	macroinvert
W15	2	05/10/10	1610	15.1	42.698	2.008	PSD/chem.
W16	1	05/10/10	1620	13.6	42.548	1.807	macroinvert
W16	2	05/10/10	1623	13.7	42.527	1.819	PSD/chem.
W17	1	05/10/10	1634	13.0	42.188	1.812	macroinvert
W17	2	05/10/10	1637	13.4	42.214	1.787	PSD/chem.
W18	1	05/10/10	1647	13.6	42.036	2.082	macroinvert
W18	2	05/10/10	1650	13.4	42.049	2.074	PSD/chem.
W19	1	05/10/10	1754	16.4	42.029	5.009	macroinvert
W19	2	05/10/10	1757	16.4	42.028	5.017	PSD/chem.
W20	1	05/10/10	1816	15.6	43.498	3.979	macroinvert
W20	2	05/10/10	1819	15.7	43.509	3.972	PSD/chem
W21	1	05/10/10	1839	15.6	44.979	4.035	macroinvert
W21	2	05/10/10	1842	15.6	45.004	4.016	PSD/chem
W22	1	05/11/10	0800	14.2	45.509	59.975	macroinvert
W22	2	05/11/10	0803	14.2	45.510	59.983	PSD/chem
W23	1	05/11/10	0823	13.4	43.994	59.974	macroinvert
W23	2	05/11/10	0826	13.4	43.988	59.987	PSD/chem
W24	1	05/11/10	0847	14.2	42.002	59.982	macroinvert
W24	2	05/11/10	0850	14.2	41.996	59.978	PSD/chem
W25	1	05/11/10	0914	14.9	40.503	1.983	macroinvert
W25	2	05/11/10	0917	15.1	40.508	1.977	PSD/chem
W26	1	05/11/10	0937	15.2	40.503	3.485	macroinvert
W26	2	05/11/10	0940	15.3	40.518	3.465	PSD/chem

Table A3. CTD Casts.

Station ID	Date	Time	Depth (m)	Latitude (33..)	Longitude (78..)	Bottom Sample Time	Bottom Sample Depth (m)	Top Sample Time	Top Sample Depth (m)
W36	05/11/10	1302	11.1	47.644'	1.488'	1303	7.3	1304	1.0
W37	05/11/10	1228	13.1	44.210'	1.434'	1229	12.3	1230	1.0
W39	05/11/10	1053	9.1	43.528'	57.913'	1057	8.3	1059	1.0

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Appendix B

Sediment Particle Size Distribution

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Table B1. Grain Size Distribution – New Wilmington ODMDS, May 2010.

Station	% gravel	% sand	% silt	% clay	Sorting Coefficient
W11	1.78	28.23	53.98	16.01	5.279
W12	0.98	46.22	38.29	14.5	4.271
W13	1.49	98.26	0.11	0.14	0.893
W14	0.16	99.36	0.06	0.42	1.929
W15	3.36	95.96	0.19	0.49	1.118
W16	0.75	98.57	0.28	0.39	1.563
W17	0.09	99.69	0.06	0.15	2.022
W18	1.04	68.66	0.07	0.23	2.433
W19	0.14	97.69	0.54	1.63	3.054
W20	1.54	96.41	1.58	0.47	2.899
W21	0.35	98.39	0.98	0.28	2.907
W22	0.7	98.66	0.15	0.49	1.152
W23	0.14	97.55	1.49	0.82	2.698
W24	0.35	96.09	1.29	2.27	2.755
W25	0	97.33	2.6	0.07	2.511
W26	0.2	94.83	0.2	4.76	2.629

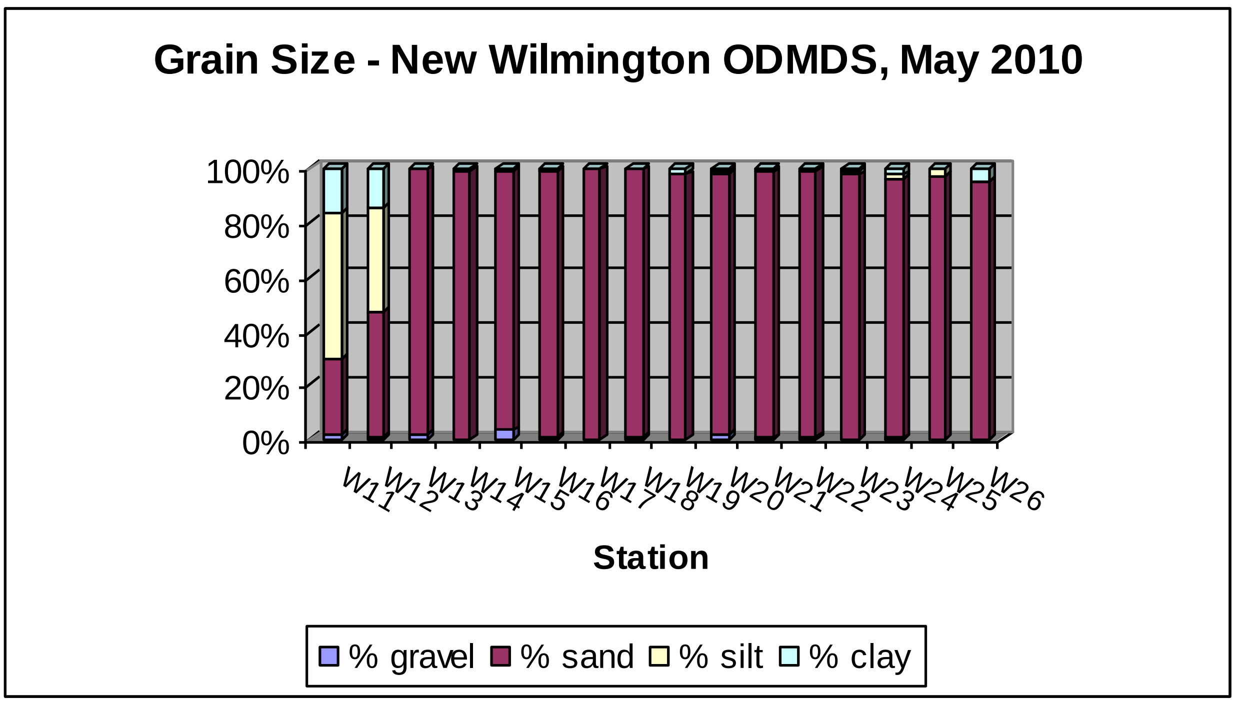

Figure B1. Grain Size Distribution – New Wilmington ODMDS, May 2010.

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APPENDIX C

Sediment Chemistry – Metals, PAHs, Pesticides, and PCBs

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NOTE: Flag "U" denotes analyte was not detected at or above the reporting limit; "J" denotes reported value is an estimate.

All values reported as mg/kg

Table C1. Sediment Chemistry, Metals – New Wilmington ODMDS, May 2010.

Analyte	W30	W31	W32	W33	W34
Aluminum	2200 J	470	950	720	600
Arsenic	4.2	1.7	2.8	2.5	2.2
Beryllium	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U
Cadmium	0.050 U	0.049 U	0.050 U	0.050 U	0.050 U
Chromium	8.0	2.2	6.9	4.8	5.8
Copper	1.5	0.49 U	0.50 U	0.50 U	0.50 U
Iron	6000	2300	2400	2100	2000
Lead	3.4	0.76	1.5	1.3	0.98
Manganese	110	35	33	27	22
Mercury	0.019 U	0.018 U	0.018 U	0.019 U	0.019 U
Nickel	2.1	0.66	1.2	0.91	0.80
Selenium	0.99 U	0.99 U	1.0 U	0.99 U	1.0 U
Silver	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Zinc	13	3.9	6.1	4.7	5.0
TOC	10000 U	9700 U	11000 U	9200 U	9400 U
% solids	63	77	72	77	75

Table C2. Sediment Chemistry, PAHs – New Wilmington ODMDS, May 2010.

Analyte	W30	W31	W32	W33	W34
2-Methylnaphthalene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Acenaphthene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Acenaphthylene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Anthracene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Benzo(a)anthracene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Benzo(a)pyrene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Benzo(b)fluoranthene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Benzo(g,h,i)perylene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Benzo(k)fluoranthene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Chrysene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Dibenz(a,h)anthracene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Fluoranthene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Fluorene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Indeno(1,2,3,c,d)pyrene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Naphthalene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Pentachlorophenol	12 U	10 U	11 U	9.8 U	10 U
Phenanthrene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U
Pyrene	6.0 U	4.9 U	5.2 U	4.8 U	5.1 U

Table C3. Sediment Chemistry, PCBs – New Wilmington ODMDS, May 2010.

PCB congenger	W30	W31	W32	W33	W34
8	7.6 U	0.49 U	2.0 U	1.9 U	1.1 U
18	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
28	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
44	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
49	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
52	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
66	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
77	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
87	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
101	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
105	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
118	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
126	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
128	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
138	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
153	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
156	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
169	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
170	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
180	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
183	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
184	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
187	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
195	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
206	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
209	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U

Table C4. Sediment Chemistry, Pesticidess – New Wilmington ODMDS, May 2010.

ANALYTE	W30	W31	W32	W33	W34
4,4'-DDD	1.2 U	0.99 U	1.1 U	0.98 U	1.0 U
4,4'-DDE	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
4,4'-DDT	1.5 U	1.2 U	1.3 U	1.2 U	1.3 U
Aldrin	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
alpha BHC (Lindane Derivative)	0.31 U	0.25 U	0.27 U	0.24 U	0.26 U
alpha Chlordane	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
beta BHC (Lindane Derivative)	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
delta BHC (Lindane Derivative)	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
Dieldrin	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
Endosulfan I (alpha)	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
Endosulfan II (beta)	1.2 U	0.99 U	1.1 U	0.98 U	1.0 U
Endosulfan Sulfate	1.5 U	1.2 U	1.3 U	1.2 U	1.3 U
Endrin	1.2 U	0.99 U	1.1 U	0.98 U	1.0 U
Endrin Aldehyde	1.5 U	1.2 U	1.3 U	1.2 U	1.3 U
Endrin Ketone	1.5 U	1.2 U	1.3 U	1.2 U	1.3 U
gamma-BHC (Lindane)	0.30 U	0.25 U	0.27 U	0.24 U	0.26 U
gamma Chlordane	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
Heptachlor	0.46 U	0.37 U	0.40 U	0.37 U	0.39 U
Heptachlor Epoxide	0.61 U	0.49 U	0.53 U	0.49 U	0.52 U
Methoxychlor	3.0 U	2.5 U	2.7 U	2.4 U	2.6 U
Toxaphene	30 U	25 U	27 U	24 U	26 U

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APPENDIX D

Water Quality/CTD Data/Water Chemistry - Metals, PAHs, Pesticides, and PCBs.

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Table D1. CTD Data – Station W36, May 2010.

Depth (m)	Conductivity (S/m)	Density (kg/m3)	Turbidity (ntu's)	Dissolved Oxygen (mg/L)	Temperature ©	Salinity (ppt)	Pressure (psi)	Surface PAR	PAR
1.0	4.80	23.903	1.004	6.94	21.02	34.23	1.487	962	1618
1.3	4.80	23.905	0.947	6.93	21.02	34.23	1.827	962	854
1.5	4.80	23.905	1.018	6.94	21.01	34.23	2.191	962	616
1.8	4.80	23.906	0.948	6.93	21.01	34.23	2.591	962	505
2.0	4.80	23.906	0.949	6.93	21.02	34.23	2.913	962	456
2.3	4.80	23.904	0.963	6.92	21.02	34.23	3.277	962	429
2.5	4.80	23.902	0.877	6.92	21.02	34.23	3.633	962	400
2.8	4.80	23.903	0.91	6.92	21.02	34.23	4.005	964	374
3.0	4.80	23.905	0.904	6.93	21.01	34.23	4.376	965	360
3.3	4.80	23.906	0.864	6.93	21.01	34.23	4.753	965	316
3.5	4.80	23.907	0.937	6.93	21.01	34.23	5.121	966	306
3.8	4.80	23.906	0.968	6.92	21.01	34.23	5.471	967	290
4.0	4.80	23.906	0.956	6.92	21.01	34.23	5.846	967	266
4.3	4.80	23.906	0.998	6.92	21.01	34.23	6.219	967	247
4.5	4.80	23.906	0.895	6.93	21.01	34.23	6.566	966	233
4.8	4.80	23.907	1.079	6.93	21.01	34.23	6.942	965	215
5.0	4.80	23.907	0.931	6.94	21.01	34.23	7.301	965	201
5.3	4.80	23.907	0.899	6.94	21.01	34.23	7.664	965	188
5.5	4.80	23.907	0.909	6.95	21.00	34.23	8.025	965	178
5.8	4.80	23.907	0.946	6.95	21.01	34.23	8.398	965	167
6.0	4.80	23.907	0.951	6.95	21.01	34.23	8.758	965	156
6.3	4.80	23.907	1.211	6.95	21.01	34.23	9.134	965	146
6.5	4.80	23.907	1.023	6.95	21.01	34.23	9.497	966	137
6.8	4.80	23.907	0.927	6.95	21.01	34.23	9.858	967	129
7.0	4.80	23.906	0.978	6.95	21.01	34.23	10.206	967	121
7.3	4.80	23.907	0.856	6.95	21.01	34.23	10.576	967	114
7.5	4.80	23.906	0.886	6.95	21.01	34.23	10.951	967	106
7.8	4.80	23.906	0.902	6.96	21.01	34.23	11.316	969	100
8.0	4.80	23.907	0.897	6.96	21.01	34.23	11.684	969	96
8.3	4.80	23.907	0.938	6.98	21.01	34.23	12.042	969	86
8.0	4.80	23.907	0.987	6.95	21.01	34.23	11.694	973	94
7.8	4.80	23.907	0.912	6.98	21.00	34.23	11.328	978	99
7.5	4.80	23.907	0.969	6.98	21.00	34.23	10.943	978	107
7.3	4.80	23.907	1.06	6.97	21.00	34.23	10.599	978	114
7.0	4.80	23.907	0.957	6.97	21.00	34.23	10.226	978	122
6.8	4.80	23.907	0.957	6.97	21.00	34.23	9.862	978	129
6.5	4.80	23.907	0.889	6.96	21.00	34.23	9.497	977	138
6.3	4.80	23.907	0.966	6.96	21.00	34.23	9.13	978	147
6.0	4.80	23.907	0.938	6.95	21.00	34.23	8.759	978	154
5.8	4.80	23.907	1.075	6.96	21.00	34.23	8.398	978	166
5.5	4.80	23.907	0.884	6.96	21.00	34.23	8.023	978	181
5.3	4.80	23.907	0.907	6.96	21.00	34.23	7.665	979	194
5.0	4.80	23.907	0.928	6.96	21.00	34.23	7.308	980	208
4.8	4.80	23.907	0.968	6.96	21.00	34.23	6.941	980	225
4.5	4.80	23.907	0.973	6.95	21.00	34.23	6.588	980	243
4.3	4.80	23.907	1.03	6.95	21.00	34.23	6.218	980	261
4.0	4.80	23.907	0.89	6.95	21.00	34.23	5.848	980	285

3.8	4.80	23.907	0.981	6.97	21.00	34.23	5.472	980	300
3.5	4.80	23.907	0.947	6.97	21.00	34.23	5.106	980	310
3.3	4.80	23.907	0.875	6.96	21.00	34.23	4.733	980	334
3.0	4.80	23.907	0.853	6.95	21.00	34.23	4.39	980	371
2.8	4.80	23.907	0.875	6.94	21.00	34.23	4.025	980	406
2.5	4.80	23.907	0.961	6.94	21.00	34.23	3.658	980	423
2.3	4.80	23.907	0.917	6.95	21.00	34.23	3.295	981	459
2.0	4.80	23.907	0.881	6.96	21.00	34.23	2.928	982	518
1.8	4.80	23.907	0.891	6.95	21.00	34.23	2.568	982	521
1.5	4.80	23.907	0.945	6.93	21.00	34.23	2.214	982	591
1.3	4.80	23.907	0.92	6.95	21.00	34.23	1.846	984	649
1.0	4.80	23.906	0.933	6.94	21.01	34.23	1.496	990	1447
0.8	4.80	23.906	0.931	7.00	21.01	34.21	1.117	1005	1505
0.5	4.80	23.905	0.915	8.51	21.01	34.06	0.694	1004	1549
0.3	4.80	23.904	1.042	8.40	21.01	33.92	0.384	1004	1561
0.0	4.80	23.903	1.08	7.90	21.00	33.58	-0.045	1004	1584

Table D2. CTD Data – Station W37, May 2010.

Depth (m)	Conductivity (S/m)	Density (kg/m3)	Turbidity (ntu's)	Dissolved Oxygen (mg/L)	Temperature ©	Salinity (ppt)	Pressure (psi)	Surface PAR	PAR
1.0	4.81	24.077	0.846	7.02	20.86	34.41	1.463	1024	973
1.3	4.81	24.078	0.731	7.01	20.86	34.41	1.84	1023	512
1.5	4.81	24.078	0.733	7.01	20.87	34.41	2.196	1021	392
1.8	4.81	24.077	0.694	7.00	20.87	34.41	2.494	1021	384
2.0	4.81	24.077	0.747	7.02	20.86	34.40	2.904	1021	430
2.3	4.81	24.078	0.724	7.01	20.86	34.40	3.282	1019	366
2.5	4.81	24.077	0.715	7.00	20.87	34.40	3.649	1019	339
2.8	4.81	24.077	0.707	7.01	20.87	34.40	4.014	1018	312
3.0	4.81	24.077	0.692	7.02	20.87	34.40	4.374	1017	297
3.3	4.81	24.077	0.671	7.03	20.87	34.40	4.74	1016	311
3.5	4.81	24.078	0.699	7.02	20.86	34.41	5.106	1015	295
3.8	4.81	24.079	0.7	7.02	20.86	34.41	5.477	1014	285
4.0	4.81	24.079	0.707	7.02	20.86	34.41	5.848	1015	267
4.3	4.81	24.080	1.227	7.03	20.86	34.41	6.215	1015	247
4.5	4.81	24.081	0.65	7.03	20.86	34.41	6.564	1014	226
4.8	4.81	24.080	0.749	7.02	20.86	34.41	6.93	1014	210
5.0	4.81	24.080	0.677	7.02	20.86	34.41	7.298	1013	201
5.3	4.81	24.080	0.693	7.02	20.86	34.41	7.662	1013	197
5.5	4.81	24.079	0.661	7.02	20.86	34.41	8.036	1013	190
5.8	4.81	24.079	0.686	7.01	20.86	34.41	8.408	1012	184
6.0	4.81	24.079	0.661	7.00	20.86	34.40	8.768	1010	177
6.3	4.81	24.079	0.622	6.99	20.86	34.40	9.129	1010	171
6.5	4.81	24.079	0.663	7.00	20.86	34.40	9.505	1008	162
6.8	4.81	24.079	0.69	7.01	20.86	34.40	9.861	1008	152
7.0	4.81	24.078	0.679	7.02	20.86	34.40	10.228	1006	141
7.3	4.81	24.078	0.726	7.02	20.86	34.40	10.591	1006	131
7.5	4.81	24.077	0.666	7.02	20.86	34.40	10.946	1006	123
7.8	4.81	24.078	0.655	7.02	20.86	34.40	11.308	1004	116
8.0	4.81	24.079	0.648	7.01	20.86	34.40	11.669	1004	112
8.3	4.81	24.078	0.667	7.00	20.86	34.40	12.053	1005	111
8.5	4.81	24.079	0.646	7.01	20.86	34.41	12.429	1006	107

8.8	4.81	24.082	0.666	7.02	20.85	34.41	12.789	1006	101
9.0	4.81	24.084	0.648	7.03	20.85	34.41	13.153	1005	94
9.3	4.81	24.084	0.644	7.03	20.85	34.41	13.523	1005	88
9.5	4.80	24.090	0.691	7.02	20.84	34.41	13.888	1005	83
9.8	4.80	24.094	0.691	7.01	20.84	34.41	14.217	1004	80
10.0	4.80	24.088	0.686	7.01	20.84	34.41	14.595	1004	76
10.3	4.81	24.083	0.672	7.01	20.84	34.41	14.96	1004	72
10.5	4.80	24.100	0.738	7.03	20.82	34.42	15.325	1004	70
10.8	4.80	24.128	0.857	7.03	20.78	34.44	15.713	1004	70
11.0	4.80	24.127	0.913	6.98	20.77	34.44	16.074	1004	68
11.3	4.80	24.130	1.081	6.96	20.75	34.45	16.455	1004	64
11.5	4.80	24.148	0.996	6.95	20.73	34.46	16.8	1003	61
11.8	4.80	24.175	1.931	6.95	20.70	34.47	17.183	1001	58
12.0	4.80	24.200	3.268	6.95	20.68	34.48	17.527	1002	55
12.3	4.79	24.212	3.437	6.95	20.67	34.49	17.902	1001	52
13.3	4.80	24.206	3.84	6.96	20.66	34.49	18.137	999	50
11.0	4.80	24.123	1.152	7.02	20.78	34.44	16.224	971	65
10.8	4.80	24.115	0.855	7.02	20.79	34.43	15.71	969	71
10.5	4.80	24.111	0.859	7.01	20.80	34.43	15.345	967	74
10.3	4.80	24.104	0.811	6.99	20.81	34.42	14.982	966	77
10.0	4.80	24.107	0.781	7.03	20.81	34.42	14.634	957	77
9.8	4.80	24.096	0.844	7.02	20.83	34.42	14.25	951	79
9.5	4.80	24.099	0.832	7.01	20.82	34.42	13.887	949	83
9.3	4.80	24.106	0.946	7.01	20.82	34.42	13.512	949	88
9.0	4.80	24.108	0.836	7.02	20.81	34.42	13.147	949	92
8.8	4.80	24.110	0.79	7.03	20.81	34.42	12.782	949	98
8.5	4.80	24.108	0.776	7.03	20.81	34.42	12.419	947	103
8.3	4.80	24.106	0.782	7.03	20.81	34.42	12.055	947	108
8.0	4.80	24.101	0.75	7.02	20.82	34.42	11.683	947	112
7.8	4.80	24.099	0.7	7.01	20.82	34.42	11.32	946	118
7.5	4.80	24.097	0.711	7.01	20.83	34.42	10.962	947	125
7.3	4.80	24.088	0.649	7.01	20.84	34.41	10.584	947	134
7.0	4.80	24.086	0.747	7.01	20.84	34.41	10.227	945	142
6.8	4.80	24.085	0.628	7.01	20.85	34.41	9.864	945	150
6.5	4.80	24.085	0.652	7.02	20.85	34.41	9.499	945	158
6.3	4.81	24.084	0.64	7.03	20.85	34.41	9.134	945	167
6.0	4.81	24.080	0.657	7.02	20.86	34.41	8.775	945	175
5.8	4.81	24.077	0.643	7.01	20.86	34.40	8.403	945	186
5.5	4.81	24.077	0.716	7.00	20.86	34.40	8.027	943	201
5.3	4.81	24.077	0.674	7.01	20.86	34.40	7.67	943	213
5.0	4.81	24.078	0.663	7.02	20.86	34.40	7.31	943	221
4.8	4.81	24.079	0.736	7.02	20.86	34.40	6.945	941	229
4.5	4.81	24.080	0.653	7.02	20.86	34.41	6.591	941	237
4.3	4.81	24.081	0.639	7.02	20.86	34.41	6.207	941	257
4.0	4.81	24.081	0.633	7.02	20.86	34.41	5.833	941	279
3.8	4.81	24.079	0.661	7.02	20.86	34.41	5.467	941	296
3.5	4.81	24.080	0.646	7.02	20.86	34.41	5.115	941	308
3.3	4.81	24.079	0.645	7.03	20.86	34.40	4.749	941	329
3.0	4.81	24.079	0.66	7.04	20.86	34.40	4.384	941	341
2.8	4.81	24.079	0.642	7.04	20.86	34.40	4.032	941	344
2.5	4.81	24.078	0.64	7.04	20.86	34.40	3.677	941	406
2.3	4.81	24.077	0.648	7.03	20.86	34.40	3.286	940	435
2.0	4.81	24.078	0.672	7.02	20.86	34.40	2.905	941	449
1.8	4.81	24.077	0.695	7.01	20.86	34.40	2.554	939	469

1.5	4.81	24.077	0.677	7.02	20.86	34.40	2.18	940	489
1.3	4.81	24.077	0.639	7.02	20.86	34.40	1.813	939	533
1.0	4.81	24.077	0.647	7.03	20.86	34.40	1.459	940	986
0.8	4.81	24.077	0.651	7.03	20.86	34.40	1.087	941	1295
0.5	4.81	24.077	0.683	7.03	20.86	34.40	0.726	941	1291
0.3	4.81	24.076	0.559	7.03	20.86	34.40	0.378	941	1291
0.0	4.48	22.127	0.685	5.30	20.86	32.31	0.001	932	1348

Table D3. CTD Data – Station W39, May 2010.

Depth (m)	Conductivity (S/m)	Density (kg/m3)	Turbidity (ntu's)	Dissolved Oxygen (mg/L)	Temperature ©	Salinity (ppt)	Pressure (psi)	Surface PAR	PAR
1.0	4.79	23.886	1.401	6.87	20.95	34.18	1.491	2305	4221
1.3	4.79	23.887	1.311	6.87	20.95	34.18	1.831	2305	2104
1.5	4.79	23.887	1.115	6.88	20.95	34.18	2.184	2304	1642
1.8	4.79	23.886	1.372	6.88	20.95	34.18	2.54	2305	1782
2.0	4.79	23.886	1.263	6.89	20.95	34.18	2.921	2307	1729
2.3	4.79	23.887	1.403	6.89	20.94	34.18	3.279	2312	1588
2.5	4.79	23.888	1.291	6.89	20.94	34.18	3.648	2315	1323
2.8	4.79	23.888	1.226	6.88	20.94	34.18	4.017	2319	1275
3.0	4.79	23.888	1.334	6.89	20.94	34.18	4.392	2324	1126
3.3	4.79	23.888	1.279	6.89	20.94	34.18	4.746	2327	1107
3.5	4.79	23.888	1.203	6.88	20.94	34.18	5.103	2329	967
3.8	4.79	23.888	1.192	6.89	20.94	34.18	5.456	2331	844
4.0	4.79	23.889	1.164	6.88	20.94	34.18	5.831	2340	822
4.3	4.79	23.889	1.166	6.88	20.94	34.18	6.201	2341	766
4.5	4.79	23.889	1.103	6.89	20.94	34.18	6.554	2342	596
4.8	4.79	23.889	1.163	6.88	20.94	34.18	6.932	2346	583
5.0	4.79	23.889	1.101	6.87	20.94	34.18	7.293	2350	472
5.3	4.79	23.889	1.166	6.88	20.94	34.18	7.667	2361	527
5.5	4.79	23.889	1.089	6.90	20.94	34.18	8.034	2367	539
5.8	4.79	23.889	1.109	6.90	20.94	34.18	8.402	2369	437
6.0	4.79	23.888	1.115	6.89	20.94	34.18	8.76	2371	428
6.3	4.79	23.888	1.162	6.87	20.94	34.18	9.13	2375	454
6.5	4.79	23.887	1.169	6.89	20.94	34.18	9.49	2380	406
6.8	4.79	23.888	1.18	6.89	20.94	34.18	9.855	2382	373
7.0	4.79	23.888	1.169	6.88	20.94	34.18	10.223	2389	386
7.3	4.79	23.890	1.157	6.88	20.93	34.18	10.588	2391	342
7.5	4.78	23.891	1.122	6.87	20.93	34.18	10.947	2395	312
7.8	4.79	23.890	1.222	6.87	20.93	34.18	11.316	2400	319
8.0	4.78	23.890	1.048	6.88	20.93	34.18	11.667	2400	291
8.3	4.78	23.890	1.123	6.88	20.93	34.18	12.044	2402	268
8.5	4.78	23.890	1.293	6.87	20.93	34.18	12.417	2402	265
8.8	4.78	23.891	1.154	6.87	20.93	34.18	12.773	2402	236
9.0	4.78	23.891	1.261	6.88	20.92	34.18	13.123	2418	224
9.3	4.79	23.891	1.317	6.87	20.93	34.18	13.455	2428	217
9.0	4.78	23.891	1.27	6.87	20.93	34.18	13.141	2421	213
8.8	4.78	23.891	1.353	6.87	20.93	34.18	12.768	2420	238
8.5	4.78	23.891	1.347	6.87	20.93	34.18	12.414	2418	266
8.3	4.79	23.891	1.249	6.87	20.93	34.18	12.059	2416	292
8.0	4.79	23.891	1.183	6.87	20.93	34.18	11.706	2414	305
7.8	4.79	23.890	1.214	6.88	20.93	34.18	11.344	2408	332
7.5	4.79	23.890	1.078	6.88	20.93	34.18	10.987	2395	343

7.3	4.78	23.892	1.276	6.86	20.92	34.18	10.595	2386	360
7.0	4.78	23.892	1.282	6.86	20.92	34.18	10.237	2381	374
6.8	4.78	23.892	1.222	6.87	20.92	34.18	9.866	2382	399
6.5	4.78	23.892	1.163	6.87	20.92	34.18	9.501	2382	424
6.3	4.78	23.892	1.235	6.86	20.92	34.18	9.137	2380	491
6.0	4.78	23.892	1.154	6.89	20.92	34.18	8.768	2378	493
5.8	4.78	23.891	1.142	6.84	20.93	34.18	8.403	2372	525
5.5	4.78	23.891	1.161	6.84	20.93	34.18	8.032	2369	624
5.3	4.78	23.887	1.187	6.85	20.93	34.18	7.684	2365	605
5.0	4.78	23.891	1.154	6.87	20.93	34.18	7.312	2355	674
4.8	4.78	23.890	1.194	6.88	20.93	34.18	6.934	2347	703
4.5	4.78	23.890	1.151	6.86	20.93	34.18	6.583	2346	816
4.3	4.78	23.890	1.12	6.85	20.93	34.18	6.226	2345	763
4.0	4.78	23.890	1.126	6.86	20.93	34.18	5.848	2343	887
3.8	4.78	23.890	1.137	6.87	20.93	34.18	5.49	2343	895
3.5	4.78	23.890	1.139	6.84	20.93	34.18	5.118	2342	1080
3.3	4.78	23.890	1.188	6.84	20.93	34.18	4.755	2339	1146
3.0	4.78	23.890	1.142	6.84	20.93	34.18	4.384	2337	1193
2.8	4.78	23.890	1.156	6.85	20.93	34.18	4.056	2329	1291
2.5	4.78	23.890	1.178	6.86	20.93	34.18	3.656	2322	1361
2.3	4.78	23.890	1.164	6.86	20.93	34.18	3.291	2318	1484
2.0	4.78	23.889	1.156	6.86	20.93	34.18	2.942	2316	1737
1.8	4.78	23.889	1.178	6.87	20.93	34.18	2.575	2323	1756
1.5	4.78	23.890	1.136	6.87	20.93	34.18	2.213	2326	1965
1.3	4.78	23.890	1.148	6.87	20.93	34.18	1.825	2322	2077
1.0	4.78	23.890	0.485	6.87	20.93	34.18	1.483	2321	3151
0.8	4.78	23.890	-0.078	6.85	20.93	34.18	1.134	2322	4451
0.5	4.78	23.890	0	6.85	20.93	34.18	0.773	2315	4267
0.3	4.78	23.891	0	6.83	20.92	34.18	0.371	2313	4153
0.0	4.78	23.890	0	0.00	20.92	34.18	-0.015	2309	4146

For the following analytical results, the following NOTE applies:

NOTE: Flag "U" denotes analyte was not detected at or above the reporting limit; "J" denotes reported value is an estimate.

All values reported as ug/L

Table D4. Water Chemistry, Metals – New Wilmington ODMDS, May 2010.

Analyte	W36top	W36bottom	W37top	W37bottom	W39top	W39bottom
Aluminum	50 UJ	50 UJ	50 UJ	50 UJ	50 UJ	50 UJ
Arsenic	1.6 J	1.5 J	1.4 UJ	1.2 UJ	1.4 J	1.6 J
Beryllium	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Cadmium	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chromium	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Copper	11 J	13 J	6.8 J	8.0 J	5.8 J	4.2 J
Iron	2400	2400	2300	2300	2200	2300
Lead	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ
Manganese	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.0 UJ
Mercury	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	12 J	11 J	11 J	12 J	13 J	11 J
Selenium	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ
Silver	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Zinc	4.8 UJ	2.0 UJ	2.0 UJ	6.5 UJ	2.4 UJ	3.2 UJ

Table D5. Water Chemistry, PAHs – New Wilmington ODMDS, May 2010.

Analyte	W36top	W36bottom	W37top	W37bottom	W39top	W39bottom
2-Methylnaphthalene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Acenaphthene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Acenaphthylene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Anthracene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Benzo(a)anthracene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Benzo(a)pyrene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Benzo(b/k)fluoranthene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Benzo(g,h,i)perylene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Chrysene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Dibenz(a,h)anthracene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Fluoranthene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Fluorene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Indeno(1,2,3,c,d)pyrene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Naphthalene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Pentachlorophenol	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Phenanthrene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Pyrene	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U

Table D6. Water Chemistry, PCBs – New Wilmington ODMDS, May 2010.

PCB congenger	W36top	W36bottom	W37top	W37bottom	W39top	W39bottom
8	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
18	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
28	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
44	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
49	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
52	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
66	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
77	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
87	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
101	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
105	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
118	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
126	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
128	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
138	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
153	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
156	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
169	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
170	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ
180	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ
183	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
184	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
187	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U
195	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ
206	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ	0.016 UJ
209	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U

Table D7. Water Chemistry, Pesticides – New ODMDS, May 2010.

ANALYTE	W36top	W36bottom	W37top	W37bottom	W39top	W39bottom
4,4’-DDD	0.0082 U	0.0082 U	0.0080 U	0.0080 U	0.0078 UJ	0.0079 U
4,4’-DDE	0.0041 U	0.0041 U	0.0040 U	0.0040 U	0.0039 UJ	0.0039 U
4,4’-DDT	0.010 U	0.010 U	0.010 U	0.010 U	0.0097 U	0.0099 U
Aldrin	0.0041 U	0.0041 U	0.0040 U	0.0040 U	0.0039 UJ	0.0039 U
alpha BHC (Lindane Derivative)	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0019 U	0.0020 U
alpha Chlordane	0.0041 U	0.0041 U	0.0040 U	0.0040 U	0.0039 UJ	0.0039 U
beta BHC (Lindane Derivative)	0.0041 U	0.0041 U	0.0040 U	0.0040 U	0.0039 UJ	0.0039 U
delta BHC (Lindane Derivative)	0.0041 U	0.0041 U	0.0040 U	0.0040 U	0.0039 U	0.0039 U
Dieldrin	0.0041 U	0.0041 U	0.0040 U	0.0040 U	0.0039 U	0.0039 U
Endosulfan I (alpha)	0.0041 U	0.0041 U	0.0040 U	0.0040 U	0.0039 U	0.0039 U
Endosulfan II (beta)	0.0082 U	0.0082 U	0.0080 U	0.0080 U	0.0078 U	0.0079 U
Endosulfan Sulfate	0.010 U	0.010 U	0.010 U	0.010 U	0.0097 UJ	0.0099 U
Endrin	0.0082 U	0.0082 U	0.0080 U	0.0080 U	0.0078 UJ	0.0079 U
Endrin Aldehyde	0.010 U	0.010 U	0.010 U	0.010 U	0.0097 U	0.0099 U
Endrin Ketone	0.010 U	0.010 U	0.010 U	0.010 U	0.0097 U	0.0099 U
gamma-BHC (Lindane)	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0019 UJ	0.0020 U
gamma Chlordane	0.0041 U	0.0041 U	0.0040 U	0.0040 U	0.0039 UJ	0.0039 U
Heptachlor	0.0031 U	0.0031 U	0.0030 U	0.0030 U	0.0029 U	0.0030 U
Heptachlor Epoxide	0.0041 U	0.0041 U	0.0040 U	0.0040 U	0.0039 U	0.0039 U
Methoxychlor	0.020 U	0.020 U	0.020 U	0.020 U	0.019 U	0.020 U
Toxaphene	0.20 U	0.20 U	0.20 U	0.20 U	0.19 U	0.20 U

APPENDIX E

Benthic Macroinvertebrate Data

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Table E1. Summary of abundance of major benthic macroinfaunal taxonomic groups by station for the New Wilmington ODMDS stations, June 2010.

Location	Station	Taxa	Total No Taxa	% Total	Total No Individuals	% Total
Inside New ODMDS	W13	Annelida	16	45.7	53	32.3
		Mollusca	6	17.1	10	6.1
		Arthropoda	10	28.6	97	59.1
		Echinodermata	1	2.9	1	0.6
		Other Taxa	2	5.7	3	1.8
		Total	**35**		**164**	
	W14	Annelida	11	39.3	35	42.7
		Mollusca	8	28.6	22	26.8
		Arthropoda	6	21.4	17	20.7
		Echinodermata	2	7.1	2	2.4
		Other Taxa	1	3.6	6	7.3
		Total	**28**		**82**	
	W15	Annelida	11	47.8	17	29.8
		Mollusca	1	4.3	1	1.8
		Arthropoda	9	39.1	36	63.2
		Echinodermata	0	0.0	0	0.0
		Other Taxa	2	8.7	3	5.3
		Total	**23**		**57**	
	W16	Annelida	5	17.9	7	2.5
		Mollusca	6	21.4	197	70.9
		Arthropoda	15	53.6	70	25.2
		Echinodermata	1	3.6	3	1.1
		Other Taxa	1	3.6	1	0.4
		Total	**28**		**278**	
	W17	Annelida	8	36.4	11	26.8
		Mollusca	5	22.7	6	14.6
		Arthropoda	8	36.4	21	51.2
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	4.5	3	7.3
		Total	**22**		**41**	

Table E1 cont

Location	Station	Taxa	Total No Taxa	% Total	Total No Individuals	% Total
	W18	Annelida	8	47.1	18	54.5
		Mollusca	3	17.6	3	9.1
		Arthropoda	6	35.3	12	36.4
		Echinodermata	0	0.0	0	0.0
		Other Taxa	0	0.0	0	0.0
		Total	**17**		**33**	
Outside New ODMDS	W19	Annelida	16	50.0	56	44.8
		Mollusca	7	21.9	23	18.4
		Arthropoda	5	15.6	36	28.8
		Echinodermata	1	3.1	1	0.8
		Other Taxa	3	9.4	9	7.2
		Total	**32**		**125**	
	W20	Annelida	21	43.8	71	45.5
		Mollusca	6	12.5	18	11.5
		Arthropoda	15	31.3	55	35.3
		Echinodermata	1	2.1	1	0.6
		Other Taxa	5	10.4	11	7.1
		Total	**48**		**156**	
	W21	Annelida	22	55.0	57	62.0
		Mollusca	12	30.0	24	26.1
		Arthropoda	1	2.5	1	1.1
		Echinodermata	0	0.0	0	0.0
		Other Taxa	5	12.5	10	10.9
		Total	**40**		**92**	
	W22	Annelida	13	86.7	44	88.0
		Mollusca	1	6.7	3	6.0
		Arthropoda	0	0.0	0	0.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	6.7	3	6.0
		Total	**15**		**50**	

Location	Station	Taxa	Total No Taxa	% Total	Total No Individuals	% Total
	W23	Annelida	16	51.6	33	54.1
		Mollusca	5	16.1	12	19.7
		Arthropoda	6	19.4	10	16.4
		Echinodermata	0	0.0	0	0.0
		Other Taxa	4	12.9	6	9.8
		Total	**31**		**61**	
	W24	Annelida	13	41.9	27	27.6
		Mollusca	6	19.4	17	17.3
		Arthropoda	10	32.3	49	50.0
		Echinodermata	0	0.0	0	0.0
		Other Taxa	2	6.5	5	5.1
		Total	**31**		**98**	
	W25	Annelida	11	39.3	18	17.5
		Mollusca	6	21.4	20	19.4
		Arthropoda	8	28.6	59	57.3
		Echinodermata	1	3.6	3	2.9
		Other Taxa	2	7.1	3	2.9
		Total	**28**		**103**	
	W26	Annelida	12	50.0	33	44.6
		Mollusca	4	16.7	11	14.9
		Arthropoda	7	29.2	29	39.2
		Echinodermata	0	0.0	0	0.0
		Other Taxa	1	4.2	1	1.4
		Total	**24**		**74**	

Table E2. Wet-weight biomass of major benthic macroinfaunal taxonomic groups for the New Wilmington ODMDS stations, June 2010.

Station		Biomass (g)	Station		Biomass (g)
W13 - New In	Annelida	0.2518	**W18 - New In**	Annelida	0.0553
	Mollusca	0.1583		Mollusca	0.0085
	Arthropoda	0.1043		Arthropoda	0.0105
	Echinodermata	0.0353		Echinodermata	0.0000
	Other Taxa	0.0341		Other Taxa	0.0000
	Total	0.5838		**Total**	0.0743
W14 - New In	Annelida	0.0939	**W19 - New Out**	Annelida	0.2790
	Mollusca	0.2350		Mollusca	0.0542
	Arthropoda	0.0103		Arthropoda	0.7137
	Echinodermata	0.0003		Echinodermata	0.0037
	Other Taxa	0.0729		Other Taxa	0.0554
	Total	0.4124		**Total**	1.1060
W15 - New In	Annelida	0.2166	**W20 - New Out**	Annelida	0.2207
	Mollusca	0.0051		Mollusca	0.0287
	Arthropoda	0.0473		Arthropoda	0.0494
	Echinodermata	0.0000		Echinodermata	0.0001
	Other Taxa	0.0041		Other Taxa	0.0792
	Total	0.2731		**Total**	0.3781
W16 - New In	Annelida	0.0273	**W21 - New Out**	Annelida	0.2353
	Mollusca	0.8161		Mollusca	0.1494
	Arthropoda	0.0678		Arthropoda	0.1079
	Echinodermata	0.0167		Echinodermata	0.0000
	Other Taxa	0.0003		Other Taxa	0.0698
	Total	0.9282		**Total**	0.5624
W17 - New In	Annelida	0.0186	**W22 - New Out**	Annelida	0.0982
	Mollusca	0.0790		Mollusca	0.0683
	Arthropoda	0.0630		Arthropoda	0.0000
	Echinodermata	0.0000		Echinodermata	0.0000
	Other Taxa	0.0182		Other Taxa	0.0114
	Total	0.1788		**Total**	0.1779

Station		Biomass (g)
W23 - New Out	Annelida	0.3169
	Mollusca	0.0220
	Arthropoda	0.0094
	Echinodermata	0.0000
	Other Taxa	0.0408
	Total	0.3891
W24 - New Out	Annelida	0.0808
	Mollusca	0.0112
	Arthropoda	0.0411
	Echinodermata	0.0000
	Other Taxa	0.0248
	Total	0.1579

Station		Biomass (g)
W25 - New Out	Annelida	0.0314
	Mollusca	0.0212
	Arthropoda	0.0364
	Echinodermata	0.0002
	Other Taxa	0.0046
	Total	0.0938
W26 - New Out	Annelida	0.0318
	Mollusca	0.0163
	Arthropoda	0.0209
	Echinodermata	0.0000
	Other Taxa	0.0052
	Total	0.0742

Table E3. Distribution and abundance of benthic macroinfaunal taxa for stations located inside the New Wilmington ODMDS, May 2010.

Taxa	Phylum	Class	No of Individuals	% Total	Cumulative %	Station Occurrence	% Station Occurrence
Petricola pholadiformis	Mol	Biva	166	25.34	25.34	2	33
Erichthonius brasiliensis	Art	Mala	51	7.79	33.13	2	33
Edotia triloba	Art	Mala	48	7.33	40.46	2	33
Maldanidae (LPIL)	Ann	Poly	33	5.04	45.50	1	17
Acanthohaustorius intermedius	Art	Mala	26	3.97	49.47	3	50
Mediomastus (LPIL)	Ann	Poly	24	3.66	53.13	4	67
Mitrella lunata	Mol	Gast	22	3.36	56.49	2	33
Tellina (LPIL)	Mol	Biva	16	2.44	58.93	3	50
Oxyurostylis smithi	Art	Mala	12	1.83	60.76	3	50
Apocorophium (LPIL)	Art	Mala	11	1.68	62.44	1	17
Bathyporeia parkeri	Art	Mala	11	1.68	64.12	3	50
Bivalvia (LPIL)	Mol	Biva	10	1.53	65.65	4	67
Nemertea (LPIL)	Nem	-	10	1.53	67.18	3	50
Spio (LPIL)	Ann	Poly	10	1.53	68.70	3	50
Monocorophium (LPIL)	Art	Mala	8	1.22	69.92	1	17
Pagurus (LPIL)	Art	Mala	8	1.22	71.15	2	33
Photis (LPIL)	Art	Mala	8	1.22	72.37	2	33
Caprellidae (LPIL)	Art	Mala	7	1.07	73.44	1	17
Protohaustorius wigleyi	Art	Mala	7	1.07	74.50	3	50
Eudevenopus honduranus	Art	Mala	6	0.92	75.42	3	50
Spiophanes bombyx	Ann	Poly	6	0.92	76.34	3	50
Ensis directus	Mol	Biva	5	0.76	77.10	4	67
Gastropoda (LPIL)	Mol	Gast	5	0.76	77.86	1	17
Haustoriidae (LPIL)	Art	Mala	5	0.76	78.63	2	33
Onuphidae (LPIL)	Ann	Poly	5	0.76	79.39	4	67
Oxyurostylis (LPIL)	Art	Mala	5	0.76	80.15	1	17
Abra aequalis	Mol	Biva	4	0.61	80.76	3	50
Acanthohaustorius millsi	Art	Mala	4	0.61	81.37	2	33
Apoprionospio dayi	Ann	Poly	4	0.61	81.98	1	17
Caprella penantis	Art	Mala	4	0.61	82.60	2	33
Leitoscoloplos robustus	Ann	Poly	4	0.61	83.21	2	33
Nephtys picta	Ann	Poly	4	0.61	83.82	3	50
Onuphis eremita oculata	Ann	Poly	4	0.61	84.43	3	50
Ophiuroidea (LPIL)	Ech	Ophi	4	0.61	85.04	2	33
Dispio uncinata	Ann	Poly	3	0.46	85.50	2	33

Elasmopus levis	Art	Mala	3	0.46	85.95	1	17
Metatiron tropakis	Art	Mala	3	0.46	86.41	3	50
Nereis micromma	Ann	Poly	3	0.46	86.87	2	33
Notomastus latericeus	Ann	Poly	3	0.46	87.33	1	17
Owenia fusiformis	Ann	Poly	3	0.46	87.79	1	17
Photis pugnator	Art	Mala	3	0.46	88.24	1	17
Nemertea (LPIL)	Nem	-	3	0.46	88.70	1	17
Ampelisca abdita	Art	Mala	2	0.31	89.01	1	17
Ampelisca macrocephala	Art	Mala	2	0.31	89.31	1	17
Ampharetidae (LPIL)	Ann	Poly	2	0.31	89.62	2	33
Caulleriella sp. J	Ann	Poly	2	0.31	89.92	1	17
Cerapus (LPIL)	Art	Mala	2	0.31	90.23	1	17
Corophiidae (LPIL)	Art	Mala	2	0.31	90.53	1	17
Elasmopus (LPIL)	Art	Mala	2	0.31	90.84	1	17
Leitoscoloplos (LPIL)	Ann	Poly	2	0.31	91.15	1	17
Magelona sp. H	Ann	Poly	2	0.31	91.45	1	17
Nereis succinea	Ann	Poly	2	0.31	91.76	1	17
Parvilucina multilineata	Mol	Biva	2	0.31	92.06	1	17
Sigambra tentaculata	Ann	Poly	2	0.31	92.37	2	33
Spiochaetopterus oculatus	Ann	Poly	2	0.31	92.67	1	17
Spiophanes missionensis	Ann	Poly	2	0.31	92.98	1	17
Tanaissus psammophilus	Art	Mala	2	0.31	93.28	1	17
Xanthidae (LPIL)	Art	Mala	2	0.31	93.59	1	17
Actiniaria (LPIL)	Cni	Anth	1	0.15	93.74	1	17
Anachis lafresnayi	Mol	Gast	1	0.15	93.89	1	17
Ancistrosyllis hartmanae	Ann	Poly	1	0.15	94.05	1	17
Anobothrus gracilis	Ann	Poly	1	0.15	94.20	1	17
Aoridae (LPIL)	Art	Mala	1	0.15	94.35	1	17
Bodotriidae (LPIL)	Art	Mala	1	0.15	94.50	1	17
Ceratocephale oculata	Ann	Poly	1	0.15	94.66	1	17
Cirratulidae (LPIL)	Ann	Poly	1	0.15	94.81	1	17
Columbellidae (LPIL)	Mol	Gast	1	0.15	94.96	1	17
Crassinella lunulata	Mol	Biva	1	0.15	95.11	1	17
Decapoda (LPIL)	Art	Mala	1	0.15	95.27	1	17
Diastylidae (LPIL)	Art	Mala	1	0.15	95.42	1	17
Echinoidea (LPIL)	Ech	Echi	1	0.15	95.57	1	17
Euceramus praelongus	Art	Mala	1	0.15	95.73	1	17
Fimbriosthenelais sp. A	Ann	Poly	1	0.15	95.88	1	17
Glyceridae (LPIL)	Ann	Poly	1	0.15	96.03	1	17
Goniada littorea	Ann	Poly	1	0.15	96.18	1	17
Hemipholis elongata	Ech	Ophi	1	0.15	96.34	1	17
Hemipodus roseus	Ann	Poly	1	0.15	96.49	1	17

Hesionidae (LPIL)	Ann	Poly	1	0.15	96.64	1	17
Laeonereis culveri	Ann	Poly	1	0.15	96.79	1	17
Latreutes parvulus	Art	Mala	1	0.15	96.95	1	17
Lineidae (LPIL)	Nem	Anop	1	0.15	97.10	1	17
Loimia medusa	Ann	Poly	1	0.15	97.25	1	17
Lucinidae (LPIL)	Mol	Biva	1	0.15	97.40	1	17
Metharpinia floridana	Art	Mala	1	0.15	97.56	1	17
Mysella planulata	Mol	Biva	1	0.15	97.71	1	17
Nephtys (LPIL)	Ann	Poly	1	0.15	97.86	1	17
Nereis pelagica	Ann	Poly	1	0.15	98.02	1	17
Nucula tenuis	Mol	Biva	1	0.15	98.17	1	17
Olivella dealbata	Mol	Gast	1	0.15	98.32	1	17
Paguridae (LPIL)	Art	Mala	1	0.15	98.47	1	17
Paramphinome sp. B	Ann	Poly	1	0.15	98.63	1	17
Paraprionospio pinnata	Ann	Poly	1	0.15	98.78	1	17
Semelidae (LPIL)	Mol	Biva	1	0.15	98.93	1	17
Sipuncula (LPIL)	Sip	-	1	0.15	99.08	1	17
Spio filicornis	Ann	Poly	1	0.15	99.24	1	17
Spionidae (LPIL)	Ann	Poly	1	0.15	99.39	1	17
Spisula solidissima	Mol	Biva	1	0.15	99.54	1	17
Terebellidae (LPIL)	Ann	Poly	1	0.15	99.69	1	17
Tubificidae (LPIL)	Ann	Olig	1	0.15	99.85	1	17
Unciola serrata	Art	Mala	1	0.15	100.00	1	17

Taxa Key

Ann=Annelida
- Olig=Oligochaeta
- Poly=Polychaeta

Art=Arthropoda
- Mala=Malacostraca

Cni=Cnidaria
- Anth=Anthozoa

Ech=Echinodermata
- Echi=Echinoidea
- Ophi=Ophiuroidea

Mol=Mollusca
- Biva=Bivalvia
- Gast=Gastropoda

Nem=Nemertea

Sip=Sipuncula

Table E4. Distribution and abundance of benthic macroinfaunal taxa for stations located outside the New Wilmington ODMDS, May 2010.

Taxa	Phylum	Class	Total No Individuals	% of Total	Cumulative %	Station Occurrence	% Station Occurrence
Capitellidae (LPIL)	Ann	Poly	66	8.70	8.70	7	88
Mediomastus (LPIL)	Ann	Poly	55	7.25	15.94	6	75
Ampelisca macrocephala	Art	Mala	48	6.32	22.27	4	50
Oxyurostylis smithi	Art	Mala	43	5.67	27.93	5	63
Protohaustorius wigleyi	Art	Mala	39	5.14	33.07	2	25
Eudevenopus honduranus	Art	Mala	34	4.48	37.55	5	63
Lucinidae (LPIL)	Mol	Biva	29	3.82	41.37	5	63
Tellina (LPIL)	Mol	Biva	25	3.29	44.66	7	88
Nemertea (LPIL)	Nem	-	22	2.90	47.56	7	88
Ceratocephale oculata	Ann	Poly	21	2.77	50.33	6	75
Diastylis polita	Art	Mala	19	2.50	52.83	1	13
Owenia fusiformis	Ann	Poly	19	2.50	55.34	4	50
Spiophanes bombyx	Ann	Poly	18	2.37	57.71	7	88
Goniada littorea	Ann	Poly	14	1.84	59.55	6	75
Parvilucina multilineata	Mol	Biva	13	1.71	61.26	4	50
Caecum pulchellum	Mol	Gast	12	1.58	62.85	3	38
Mediomastus californiensis	Ann	Poly	12	1.58	64.43	2	25
Polygordius (LPIL)	Ann	Poly	12	1.58	66.01	5	63
Americhelidium americanum	Art	Mala	9	1.19	67.19	4	50
Cyclaspis varians	Art	Mala	8	1.05	68.25	4	50
Phoronis (LPIL)	Pho	-	8	1.05	69.30	4	50
Pythinella cuneata	Mol	Biva	8	1.05	70.36	2	25
Sipuncula (LPIL)	Sip	-	8	1.05	71.41	4	50
Aricidea catherinae	Ann	Poly	7	0.92	72.33	2	25
Ervilia concentrica	Mol	Biva	7	0.92	73.25	1	13
Nephtys picta	Ann	Poly	7	0.92	74.18	4	50
Aglaophamus verrilli	Ann	Poly	6	0.79	74.97	3	38
Bathyporeia parkeri	Art	Mala	6	0.79	75.76	2	25
Leitoscoloplos robustus	Ann	Poly	6	0.79	76.55	4	50
Metatiron tropakis	Art	Mala	6	0.79	77.34	3	38
Onuphidae (LPIL)	Ann	Poly	6	0.79	78.13	3	38
Spionidae (LPIL)	Ann	Poly	6	0.79	78.92	4	50
Apoprionospio dayi	Ann	Poly	5	0.66	79.58	2	25
Bivalvia (LPIL)	Mol	Biva	5	0.66	80.24	3	38
Echinoidea (LPIL)	Ech	Echi	5	0.66	80.90	3	38

Maldanidae (LPIL)	Ann	Poly	5	0.66	81.55	2	25
Sigambra tentaculata	Ann	Poly	5	0.66	82.21	3	38
Ensis directus	Mol	Biva	4	0.53	82.74	2	25
Leitoscoloplos (LPIL)	Ann	Poly	4	0.53	83.27	2	25
Microprotopus raneyi	Art	Mala	4	0.53	83.79	2	25
Nephtyidae (LPIL)	Ann	Poly	4	0.53	84.32	2	25
Prionospio perkinsi	Ann	Poly	4	0.53	84.85	1	13
Rhepoxynius epistomus	Art	Mala	4	0.53	85.38	3	38
Spio pettiboneae	Ann	Poly	4	0.53	85.90	3	38
Actiniaria (LPIL)	Cni	Anth	3	0.40	86.30	2	25
Aricidea (LPIL)	Ann	Poly	3	0.40	86.69	3	38
Aricidea wassi	Ann	Poly	3	0.40	87.09	2	25
Caulleriella sp. J	Ann	Poly	3	0.40	87.48	2	25
Dipolydora socialis	Ann	Poly	3	0.40	87.88	2	25
Edotia triloba	Art	Mala	3	0.40	88.27	2	25
Glycera (LPIL)	Ann	Poly	3	0.40	88.67	2	25
Lineidae (LPIL)	Rhy	Anop	3	0.40	89.06	2	25
Lucina (LPIL)	Mol	Biva	3	0.40	89.46	1	13
Onuphis eremita oculata	Ann	Poly	3	0.40	89.86	3	38
Paraprionospio pinnata	Ann	Poly	3	0.40	90.25	2	25
Prionospio (LPIL)	Ann	Poly	3	0.40	90.65	2	25
Prionospio steenstrupi	Ann	Poly	3	0.40	91.04	3	38
Scaphopoda (LPIL)	Mol	Scap	3	0.40	91.44	1	13
Abra aequalis	Mol	Biva	2	0.26	91.70	2	25
Acteocina bidentata	Mol	Gast	2	0.26	91.96	2	25
Acteocina canaliculata	Mol	Gast	2	0.26	92.23	2	25
Argissa hamatipes	Art	Mala	2	0.26	92.49	1	13
Cirrophorus (LPIL)	Ann	Poly	2	0.26	92.75	1	13
Galathowenia oculata	Ann	Poly	2	0.26	93.02	2	25
Listriella barnardi	Art	Mala	2	0.26	93.28	2	25
Phascolion strombi	Sip	-	2	0.26	93.54	2	25
Sabellaria sp. A	Ann	Poly	2	0.26	93.81	2	25
Spiochaetopterus oculatus	Ann	Poly	2	0.26	94.07	2	25
Strombiformis bilineatus	Mol	Gast	2	0.26	94.33	2	25
Tellina iris	Mol	Biva	2	0.26	94.60	1	13
Acanthohaustorius millsi	Art	Mala	1	0.13	94.73	1	13
Ampharetidae (LPIL)	Ann	Poly	1	0.13	94.86	1	13
Ancistrosyllis hartmanae	Ann	Poly	1	0.13	94.99	1	13
Anobothrus gracilis	Ann	Poly	1	0.13	95.13	1	13
Aricidea taylori	Ann	Poly	1	0.13	95.26	1	13
Asteropterygion oculitristis	Art	Ostr	1	0.13	95.39	1	13
Axiothella mucosa	Ann	Poly	1	0.13	95.52	1	13

Bowmaniella (LPIL)	Art	Mala	1	0.13	95.65	1	13
Branchiostoma (LPIL)	Cho	Lept	1	0.13	95.78	1	13
Brania wellfleetensis	Ann	Poly	1	0.13	95.92	1	13
Cerithiidae (LPIL)	Mol	Gast	1	0.13	96.05	1	13
Deutella incerta	Art	Mala	1	0.13	96.18	1	13
Diopatra cuprea	Ann	Poly	1	0.13	96.31	1	13
Drilonereis longa	Ann	Poly	1	0.13	96.44	1	13
Erichthonius brasiliensis	Art	Mala	1	0.13	96.57	1	13
Euceramus praelongus	Art	Mala	1	0.13	96.71	1	13
Glycera dibranchiata	Ann	Poly	1	0.13	96.84	1	13
Haustoriidae (LPIL)	Art	Mala	1	0.13	96.97	1	13
Lyonsia hyalina	Mol	Biva	1	0.13	97.10	1	13
Magelona (LPIL)	Ann	Poly	1	0.13	97.23	1	13
Magelona pettiboneae	Ann	Poly	1	0.13	97.36	1	13
Metatiron (LPIL)	Art	Mala	1	0.13	97.50	1	13
Nassarius acutus	Mol	Gast	1	0.13	97.63	1	13
Olivella dealbata	Mol	Gast	1	0.13	97.76	1	13
Paguridae (LPIL)	Art	Mala	1	0.13	97.89	1	13
Paramphinome sp. B	Ann	Poly	1	0.13	98.02	1	13
Paraonis fulgens	Ann	Poly	1	0.13	98.16	1	13
Pectinaria gouldii	Ann	Poly	1	0.13	98.29	1	13
Phyllodoce arenae	Ann	Poly	1	0.13	98.42	1	13
Pinnixa cristata	Art	Mala	1	0.13	98.55	1	13
Podocopida (LPIL)	Art	Ostr	1	0.13	98.68	1	13
Rictaxis punctostriatus	Mol	Gast	1	0.13	98.81	1	13
Semelidae (LPIL)	Mol	Biva	1	0.13	98.95	1	13
Spio (LPIL)	Ann	Poly	1	0.13	99.08	1	13
Spiophanes missionensis	Ann	Poly	1	0.13	99.21	1	13
Synasterope setisparsa	Art	Ostr	1	0.13	99.34	1	13
Tectonatica pusilla	Mol	Gast	1	0.13	99.47	1	13
Terebra (LPIL)	Mol	Gast	1	0.13	99.60	1	13
Tubificidae (LPIL)	Ann	Olig	1	0.13	99.74	1	13
Turbellaria (LPIL)	Pla	Turb	1	0.13	99.87	1	13
Turbonilla (LPIL)	Mol	Gast	1	0.13	100.00	1	13

Taxa Key

Ann=Annelida
- Olig=Oligochaeta
- Poly=Polychaeta

Art=Arthropoda
- Mala=Malacostraca
- Ostr=Ostracoda

Ech=Echinodermata
- Echi=Echinoidea

Mol=Mollusca
- Biva=Bivalvia
- Gast=Gastropoda
- Scap=Scaphopoda

Pla=Platyhelminthes
- Turb=Turbellaria

Sip=Sipuncula

Cho=Chordata

Lept=Leptocardia

Cni=Cnidaria

Anth=Anthozoa

Nem=Nemertea

Anop=Anopla

Pho=Phoronida

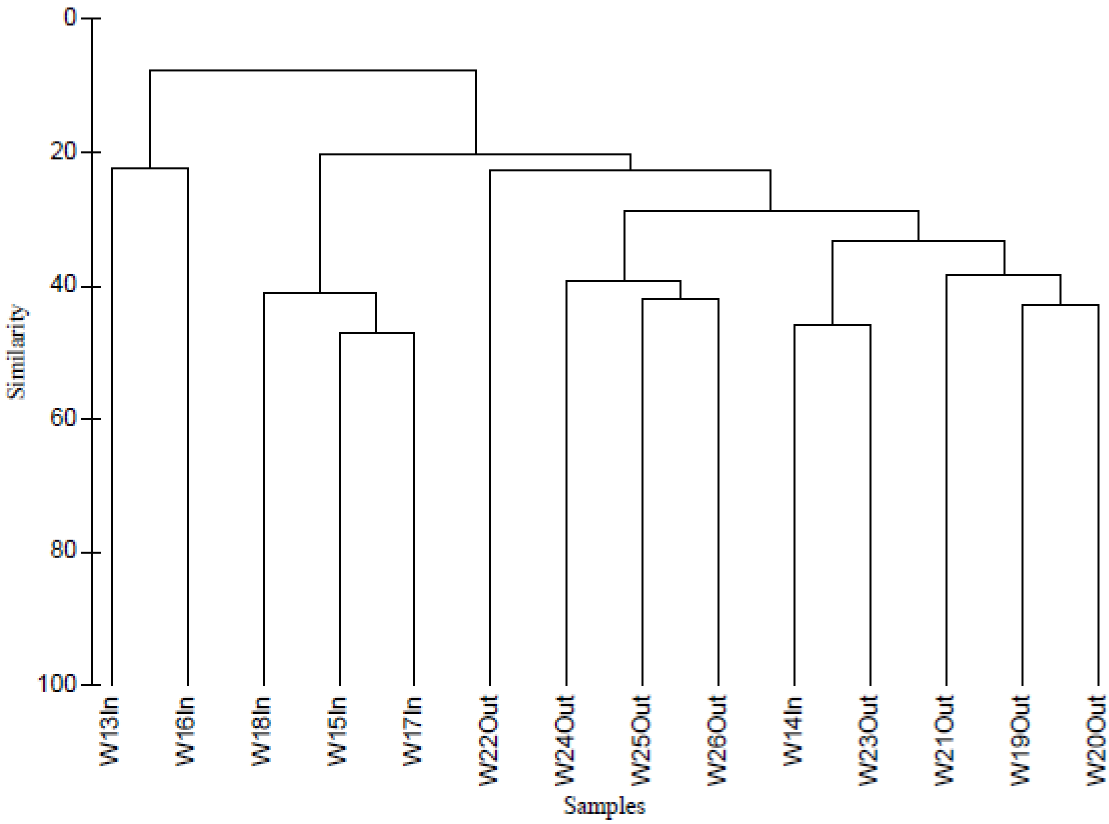

Figure E1. Results of Cluster Analysis.

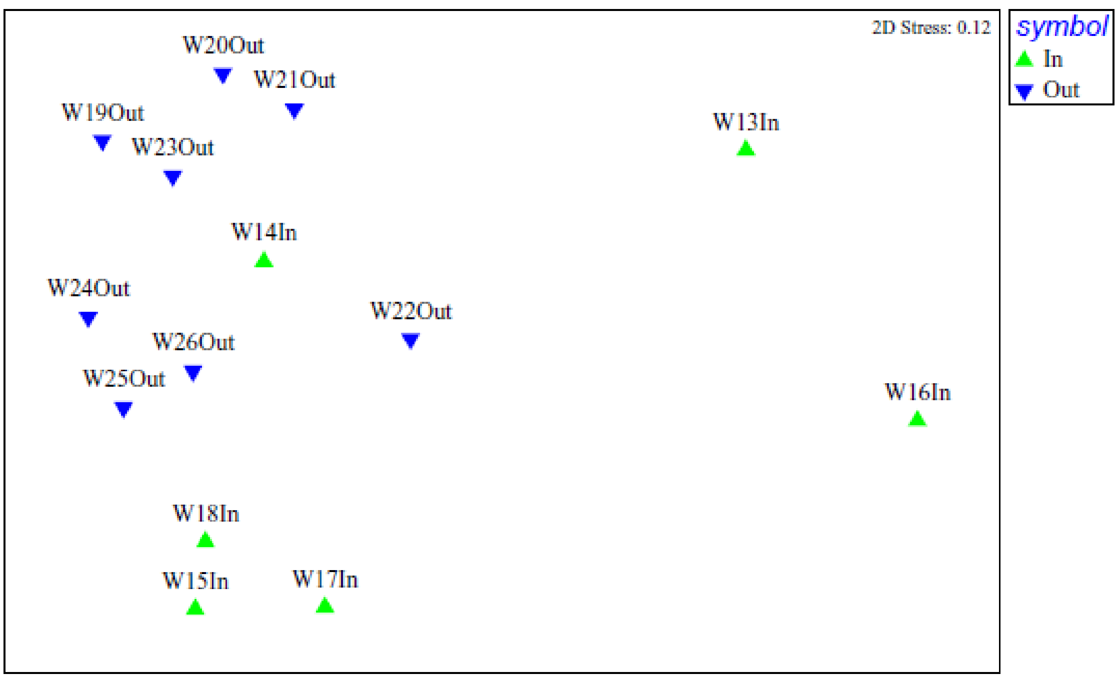

Figure E2. Results of MSD Analysis.

Table E5. A summary of the macroinfaunal assemblage parameters for the New Wilmington ODMDS stations, May 2010.

Location	Station	Total No. Taxa	Total No. Individuals	Density (nos/m2)	H' Shannon (log e)	d Diversity (log 2)	1/S Simpson Diversity	J' Pielou Evenness	D Margalef Richness	e Equitability
Inside New ODMDS	**W13**	35	164	4100.0	2.60	3.75	7.71	0.73	6.67	0.55
	W14	28	82	2050.0	2.80	4.05	12.08	0.84	6.13	0.86
	W15	23	57	1425.0	2.71	3.92	10.04	0.87	5.44	0.95
	W16	28	278	6950.0	1.74	2.51	2.69	0.52	4.80	0.28
	W17	22	41	1025.0	2.86	4.12	18.64	0.92	5.65	1.15
	W18	17	33	825.0	2.63	3.80	17.60	0.93	4.58	1.18
	Mean	**25.5**		**2729.2**	**2.56**			**0.80**		
	SD	**6.2**		**2382.7**	**0.41**			**0.16**		
Outside New ODMDS	**W19**	32	125	3125.0	2.74	3.95	9.74	0.79	6.42	0.70
	W20	48	156	3900.0	3.20	4.61	15.30	0.83	9.31	0.75
	W21	40	92	2300.0	3.32	4.78	23.39	0.90	8.62	1.02
	W22	15	50	1250.0	2.27	3.27	7.70	0.84	3.58	0.92
	W23	31	61	1525.0	3.21	4.64	28.59	0.94	7.30	1.18
	W24	31	98	2450.0	2.78	4.00	8.29	0.81	6.54	0.75
	W25	28	103	2575.0	2.52	3.63	6.35	0.76	5.83	0.64
	W26	24	74	1850.0	2.59	3.74	9.16	0.82	5.34	0.80
	Mean	**31.1**		**2371.9**	**2.83**			**0.83**		
	SD	**9.9**		**862.1**	**0.38**			**0.06**		

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APPENDIX F

Target Detection Limits

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Ocean Programs Analytical Request Table Nutrients and Classicals Analyte List Minimum Quantitation Limits by Matrices		
ANALYTE	**Water mg/L (ppm)**	**Soil/Sed mg/kg (ppm)**
Total Solids/dry weight		1.0%
Total Org. Carbon	5 (0.0005%)	0.1%
Percent Moisture		

Ocean Programs Analytical Request Table Metals Analyte List Minimum Quantitation Limits by Matrices					
ANALYTE	**Target Water μg/L (ppb)**	**WQC Saltwater CMC ug/L**	**Sediment mg/kg (ppm)**	**Tissue mg/kg (ppm)**	**Ecological Non-specific Effects Level ug/Kg**
Arsenic	1.0	69	1.0	0.2	12.6
Aluminum	500		50		
Cadmium	1.0	42	0.1	0.1	0.3
Chromium	1.0	1100 (Cr6+)	1.0	1.0	11.8
Copper	1.0	4.8	1.0	1.0	9.6
Iron	500		25		
Lead	1.0	210	0.5	0.2	11.9
Mercury	0.2	1.8	0.05	0.02	0.2
Nickel	1.0	74	1.0	1.0	3.8
Selenium	2.0	290	1.0		
Silver	1.0	1.9	0.2	0.2	1.4
Zinc Percent Moisture	1.0	90	1.0	1.0	1517

Ocean Programs Analytical Request Table PCB Congengers Target Analyte List Minimum Quantitation Limits Guidelines by Matrices			
PCB Congenger	**Water μg/L (ppb)**	**Sediment μg/kg (ppb)**	**Tissue mg/kg (ppm)**
8	0.02	1.0	0.0010
18	0.02	1.0	0.0010
28	0.02	1.0	0.0010
44	0.02	1.0	0.0010
49	0.02	1.0	0.0010
52	0.02	1.0	0.0010
66	0.02	1.0	0.0010
77	0.02	1.0	0.0010
87	0.02	1.0	0.0010
101	0.02	1.0	0.0010
105	0.02	1.0	0.0010
118	0.02	1.0	0.0010
126	0.02	1.0	0.0010
128	0.02	1.0	0.0010
138	0.02	1.0	0.0010
153	0.02	1.0	0.0010
156	0.02	1.0	0.0010
169	0.02	1.0	0.0010
170	0.02	1.0	0.0010
180	0.02	1.0	0.0010
183	0.02	1.0	0.0010
184	0.02	1.0	0.0010
187	0.02	1.0	0.0010
195	0.02	1.0	0.0010
206	0.02	1.0	0.0010
209	0.02	1.0	0.0010
Percent Moisture			

Ocean Programs Analytical Request Table PAHs (SemiVOAs) Target Analyte List Minimum Quantitation Limits Guidelines by Matrices			
ANALYTE	**Water μg/L (ppb)**	**Soil/Sed* μg/kg (ppb)**	**Tissue* mg/kg (ppm)**
2-Methylnaphthalene	10.	**20**	**0.02**
Acenaphthene	10.	**20**	**0.02**
Acenaphthylene	10.	**20**	**0.02**
Anthracene	10.	**20**	**0.02**
Benzo(a)anthracene	10.	**20**	**0.02**
Benzo(a)pyrene	10.	**20**	**0.02**
Benzo(b/k)fluoranthene	10.	**20**	**0.02**
Benzo(g,h,i)perylene	10.	**20**	**0.02**
Chrysene	10.	**20**	**0.02**
Dibenz(a,h)anthracene	10.	**20**	**0.02**
Fluoranthene	10.	**20**	**0.02**
Fluorene	10.	**20**	**0.02**
Indeno(1,2,3,c,d)pyrene	10.	**20**	**0.02**
Naphthalene	10.	**20**	**0.02**
Phenanthrene	10.	**20**	**0.02**
Pyrene	10.	**20**	**0.02**
Percent Moisture			
Ocean Programs Analytical Request Table Semivolatile Organics (Non-PAHs) Target Analyte List Minimum Quantitation Limits Guidelines by Matrices			
Pentachlorophenol	10.	**100**	**0.100**

Ocean Programs Analytical Request Table Pesticide Target Analyte List Minimum Quantitation Limits Guidelines by Matrices			
ANALYTE	**Water µg/L (ppb)**	**Sediment µg/kg (ppb)**	**Tissue mg/kg (ppm)**
Aldrin	0.5	10	0.002
alpha Chlordane	0.05	10	0.002
gamma Chlordane	0.05	10	0.002
Dieldrin	0.5	10	0.002
4,4’-DDT	0.1	10	0.002
4,4’-DDD	0.1	10	0.002
4,4’-DDE	0.1	10	0.002
Endosulfan I (alpha)	0.03	10	0.002
Endosulfan II (beta)	0.03	10	0.002
Endosulfan Sulfate	0.1	10	0.002
Endrin	0.03	10	0.002
Endrin Aldehyde	0.03	10	0.002
Endrin Ketone	0.03	10	0.002
alpha BHC (Lindane Derivative)	0.05	10	0.002
beta BHC (Lindane Derivative)	0.05	10	0.002
delta BHC (Lindane Derivative)	0.05	10	0.002
gamma-BHC (Lindane)	0.1	10	0.002
Heptachlor	0.05	10	0.002
Heptachlor Epoxide	0.05	10	0.002
Methoxychlor	0.5	10	0.002
Toxaphene	0.2	50	0.05