Macroinvertebrate Baseline Study for the Canpotex Potash Terminal Project Disposal at Sea Application

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1. Benthic Macroinvertebrate Survey Methodology

Canpotex and the Prince Rupert Port Authority (PRPA) are proposing to dispose of ~724,000 m^3 of dredgate at one or two new disposal sites within the PRPA harbour boundaries. Baseline information is required for the environmental assessment (EA) of this project, and by Environment Canada as part of the permit application process for disposal at a new site.

As a part of the baseline study for the project, the benthic fauna in the area was characterized. Benthic macroinvertebrate sampling was carried out at the two potential disposal sites using a standard Ponar grab equipped with sliders. A total of 10 benthic macroinvertebrate samples were collected (5 at each of the two sites). The sample stations at which the benthic samples were collected are shown in Figure 1 and Figure 2.

Once the sample was collected using the Ponar grab, the volume of the sediment was measured and recorded, and observations regarding the sediment particle size, odor, color, and other physical features were made. The entire sample was then screened by diluting the sample with seawater and pouring the slurry gradually through a 4 mm mesh sieve into a bucket. At this stage, invertebrates which were too large to pass through the screen were collected and placed in a glass sample container. The sample in the bucket was concentrated by sieving it through a 0.5 mm mesh sieve. Macroinvertebrates were then carefully picked from the screened material and transferred into the sample container.

Samples were fixed in a 10% buffered formalin seawater solution. Samples remained in the formalin-seawater solution for 6 days to allow proper fixation. Subsequently, the samples were transferred to 70% isopropanol.

Organisms were identified using a 10 x power magnifying lamp and a dissecting microscope. Organisms were enumerated and identified to the species level whenever possible.

2. Survey Results

2.1 Site 1

A total of 490 individual organisms in 38 taxa were identified and enumerated from the five samples taken at Site 1 (see Table 1 below). Four phyla were represented - Mollusca (14 taxa), Annelida (Polychaeta - 21 taxa), Crustacea (2 taxa), and Echinodermata (1 taxa) (see Table 2 below). While Phylum Annelida had the greatest number of taxa at the site, Phylum Mollusca had the greatest number of individuals (265).

Table 1. Diversity of benthic macroinvertebrates from Site 1.

Station	Total number of taxa	Total Number of Individuals	Shannon's diversity index	Simpson's diversity index
1-1	17	81	3.32	8.00
1-2	11	46	3.10	8.63
1-3	15	52	3.39	9.54
1-4	22	112	3.76	10.19
1-5	16	199	3.02	6.56
Totals	**38**	**490**	**--**	**--**

Two diversity indices were calculated for each station at Site 1 - Shannon's diversity index and Simpson's diversity index. The Shannon's diversity index is based on information theory and measures the order observed in a particular system. As the number of individuals observed for each taxon in a sample increases, the order of the system increases, and the Shannon's diversity index is larger. The Simpson's diversity index accounts for both the richness and proportion (percent) of each taxon in a sample. While the Shannon's diversity index is the most widely used diversity index, the Simpson's diversity index is much less sensitive to changes in sample size, and is thus more accurate under conditions where sample size is variable.

Shannon's diversity index ranged from a low of 3.02 at station 1-5 to a high of 3.76 at station 1-4. Likewise, Simpson's diversity index was also lowest at station 1-5, with a value of 6.56, and highest at station 1-4, with a value of 10.19. Figure 1 shows the positions of the stations and their Shannon's diversity indices. The stations with highest diversity tend to be on the landward side of Site 1, whereas the stations with lowest diversity tend to be on the seaward side of Site 1.

The total volume of all samples collected for Site 1 was 21 L. The average organism density was 23 organisms/L or 2.3×10^4 organisms/m^3. Since most organisms live in the upper surface of the sediment, this can also be expressed as organisms per unit area. The total area sampled for Site 1 was 0.26 m^2. Thus, the average organism density was 1875 organisms/m^2.

Table 2. Species list for Site 1.

Molluscsa (Number of taxa = 14; Number of individuals = 265)
Acila castrensis
Acteocina eximia
Astyris gausapata
Dentalium rectius
Diplodonta orbella
Euspira lewisii
Lacuna vincta
Nuculana minuta
Nutricola lordi
Nutricola tantilla
Saxidomus gigantea
Tellina carpenteri
Tellina modesta
Yoldia scissurata
Polychaeta (Number of taxa = 21; Number of individuals = 222)
Abarenicola pacifica
Amage anops
Aricidea sp.
Ceratonereis paucidentata
Cossura pygodactylata
Diplocirrus sp.
Eteone longa
Glycera capitata
Micropodarke dubia
Nephtys cornuta
Nephtys ferruginea
Nereis vexillosa
Nereis zonata
Ophelina acuminata
Polycirrus sp.
Praxillella gracilis
Protula pacifica
Scoloplos acmeceps
Sternaspis fossor
Tomopteris cavalli
Travisia pupa
Crustacea (Number of taxa = 2; Number of individuals = 2)
Diastylis sp.
Lysianassidae
Echinodermata (Number of taxa= 1; Number of individuals = 1)
Ophiura leptoctenia

2.2 Site 2

A total of 302 individual organisms in 53 taxa were identified and enumerated from the five samples taken at Site 2 (see Table 3 below). Five phyla were represented - Mollusca (18 taxa), Annelida (Polychaeta - 23 taxa), Crustacea (6 taxa), Echinodermata (5 taxa), and Chordata (1 taxa; not actually an invertebrate, but included in the count for completeness) (see Table 4 below). Phylum Annelida had both the greatest number of taxa and the greatest number of individuals (144) at the site.

Table 3. Diversity of benthic macroinvertebrates from Site 2.

Station	Total number of taxa	Total Number of Individuals	Shannon's diversity index	Simpson's diversity index
2-1	25	58	4.04	12.62
2-2	20	34	4.00	19.34
2-3	27	56	4.43	25.25
2-4	31	102	4.28	14.76
2-5	26	52	4.44	28.21
Totals	**53**	**302**	**--**	**--**

As with Site 1, two diversity indices were calculated for each station at Site 2 - Shannon's diversity index and Simpson's diversity index.

Shannon's diversity index ranged from a low of 4.00 at station 2-2 to a high of 4.44 at station 2-5. In this case, however, the Simpson's diversity index did not agree completely with the Shannon's diversity index. The Simpson's diversity index was lowest at station 2-1, with a value of 12.62, and highest at station 2-5, with a value of 28.21. Both indices agreed that maximum diversity occurred at station 2-5. Figure 2 shows the positions of the stations and their Shannon's diversity indices. Diversity is highest in the northern region of the site, and decreases southward.

The total volume of all samples collected for Site 2 was 26 L. The average organism density was 12 organisms/L or 1.2×10^4 organisms/m^3. The total area sampled for Site 2 was 0.26 m^2. Thus, the average organism density was 1156 organisms/m^2.

Table 4. Species list for Site 2.

Molluscsa (Number of taxa = 18; Number of individuals = 76)
Acila castrensis
Acteocina eximia
Astyris gausapata
Bittium munitum
Cyclocardia ventricosa
Dentalium pretiosum
Dentalium rectius
Diplodonta orbella
Euspira lewisii
Megayoldia thraciaeformis
Nuculana minuta
Nutricola tantilla
Olivella baetica
Opalia borealis
Saxidomus gigantea
Tellina carpenteri
Tellina modesta
Yoldia scissurata
Polychaeta (Number of taxa = 23; Number of individuals = 144)
Amage anops
Amphisamytha bioculata
Arabella iricolor
Dodecaceria concharum
Drilonereis falcata
Eteone longa
Euclymene zonalis
Glycera capitata
Lumbrineris luti
Neoamphitrite robusta
Nephtys ferruginea
Nereis zonata
Pectinaria granulata
Pholoe caeca
Platynereis bicanaliculata
Polycirrus sp.
Praxillella gracilis
Scalibregma inflatum
Scoloplos acmeceps
Sigalion sp.
Sternaspis fossor
Tomopteris cavalli
Travisia pupa

Table 4. Continued.

Crustacea (Number of taxa = 6; Number of individuals = 12)
Cyphocaris challengeri
Diastylis sp.
Holmesiella anomala
Munida quadrispina
Pinnixa occidentalis
Rocinela belliceps
Echinodermata (Number of taxa= 5; Number of individuals = 69)
Amphiodia periercta
Amphiodia urtica
Amphioplus strongyloplax
Molpadia intermedia
Ophiura luetkeni
Chordata (Number of taxa= 1; Number of individuals = 1)
Synchirus gilli

2.3 Site Comparisons

2.3.1 ANOVA

Using Excel, a series of single-factor ANOVA analyses were performed to compare the various attributes of the two sites.

i. Total number of taxa

Null hypothesis: The station averages of the total number of taxa at Site 1 and Site 2 are the same.

ANOVA results:

Alpha = 0.05

F = 14.68

F-crit = 5.32

P-value = 0.01

Interpretation: Null hypothesis is rejected - Site 2 has a significantly greater total number of taxa per station (25.8) than Site 1 (16.2).

ii. Total number of individuals

Null hypothesis: The station averages of the total number of individuals at Site 1 and Site 2 are the same.

ANOVA results:

Alpha = 0.05

F = 1.57

F-crit = 5.32

P-value = 0.25

Interpretation: Null hypothesis is accepted - the station averages of the total number of individuals at Site 1 (98) and Site 2 (60.4) are statistically the same.

iii. Shannon's diversity index

Null hypothesis: The station averages of the Shannon's diversity index at Site 1 and Site 2 are the same.

ANOVA results:

Alpha = 0.05

F = 33.27

F-crit = 5.32

P-value = 0.0004

Interpretation: Null hypothesis is rejected - Site 2 has a significantly greater Shannon's diversity index (4.24) per station than Site 1 (3.32).

iv. Simpson's diversity index

Null hypothesis: The station averages of the Simpson's diversity index at Site 1 and Site 2 are the same.

Alpha = 0.05

F = 14.16

F-crit = 5.32

P-value = 0.0055

Interpretation: Null hypothesis is rejected - Site 2 has a significantly greater Simpson's diversity index (20.0) per station than Site 1 (8.58).

In conclusion, while the number of individual organisms per sample was not significantly different between the two sites, Site 2 had significantly higher taxa richness and diversity indices than Site 1.

2.3.2 ANOSIM

Using the statistical software Past, an analysis of the similarity in the occurrence and abundance of species at each site was performed. An analysis of similarity (ANOSIM) routine was used to test the significance between the taxon groupings at each site. The results of the ANOSIM were as follows:

Alpha = 0.05

Permutation Number = 10,000

Distance measure = Bray-Curtis

R = 0.952

P-value = 0.0071

The Bray-Curtis distance measure is used when abundance data is available, as in this case. It is good for community data because it doesn't give too much weight to unobserved taxa. In ANOSIM, large positive R values (up to 1) signify dissimilarity between groups. Thus, the interpretation for this statistical result is that the taxon groups at Sites 1 and 2 are very dissimilar (R is nearly 1) at a high level of statistical significance (P-value is 0.0071). It is most likely that the habitats at the two sites are quite different.

2.3.3 Multi-dimensional Scaling Plot

A multi-dimensional scaling (MDS) plot was generated using the statistical software Past to compare the biological communities at Sites 1 and 2. MDS plots are used to show the "closeness" of the species composition and abundance between samples. MDS plots are commonly either 2D or 3D plots. To determine how many dimensions are best for a given data set, a scree plot is used. This is a line plot of minimum stress (or "badness-of-fit" of the regression line) on the y-axis against number of dimensions on the x-axis. A sharp break in slope of the curve, beyond which further reductions in stress are small, suggests the dimensionality which should be used. Figure 3 shows the scree plot for the data from Sites 1 and 2. The sharpest break occurs at a dimensionality of 3, suggesting that this is the value that should be used for the MDS plot.

The MDS plot comparing data from Sites 1 and 2 is shown in Figure 4. As with the ANOSIM routine, the similarity measure used was the Bray-Curtis distance. Red crosses indicate stations from Site 1, whereas blue squares indicate stations from Site 2. Ellipses showing the 95% confidence level are draw for both Sites (a red ellipse for Site 1 and a blue ellipse for Site 2). Note that there is no overlap between the ellipses. This indicates the species composition and abundance is considered to be significantly different between the two sites at the 95% level.

A Shepard plot (scatter plot of the interpoint distances) was done to determine goodness-of-fit of the MDS solution (see Figure 5). If the fit is poor, then visualization could be misleading, because large (or small) distances between points might not correspond to large (or small) dissimilarities in the data. In the Shepard plot, a narrow scatter around a 1:1 line indicates a good fit of the distances to the dissimilarities, while a large scatter or a nonlinear pattern indicates a lack of fit. The Shepard plot in Figure 5 has a relatively narrow scatter around the 1:1 line, with an R^2 value of 0.7335 (an R^2 value of 1.0 is a straight line, whereas an R^2 value of 0 is a completely random scatter).

The degree of correspondence between the distances among points implied by the MDS map and the matrix input by the user is measured (inversely) by a stress function. The value generated by the stress function can be interpreted as follows:

< 0.05	**Excellent:** no prospect of misinterpretation (rarely achieved)
0.05 – 0.10	**Good:** little danger of drawing false inferences
0.10 – 0.20	**Fair:** useable, but some distances will be misleading
> 0.20	**Poor:** ordination may be dangerous to interpret

The stress value calculated for the Shepard plot in Figure 5 was 0.09135. This indicates that the goodness-of-fit of the MDS solution is good and that there is little danger of false inferences.

2.3.4 Dendogram Analysis

A dendrogram of similarity values among the benthic macroinvertebrate grab samples at Sites 1 and 2 is shown in Figure 6. In this diagram, “groups” of samples which cluster together by common branch points are more similar to each other than to adjacent “groups”. Again, the distance used for this calculation is the Bray-Curtis metric. The dendrogram in Figure 6 clearly shows all the grab samples from Site 2 clustered on a single branch, indicating that these samples have very similar species composition and abundances. The samples from Site 1 are somewhat less clustered, suggesting that there may have been a wider range in species compositions and abundances across that site than at Site 2.

2.3.5 SIMPER

The SIMPER (Similarity Percentage) routine is a simple method for assessing which taxa are primarily responsible for an observed difference between groups of samples. The Bray-Curtis similarity measure (multiplied by 100) is implicit to SIMPER.

Using Past, the SIMPER routine was run on the data from Sites 1 and 2. The overall average dissimilarity between the two sites was 80.51%. The main species contributing to this overall dissimilarity are listed in Table 5 below. The top four species, contributing to a total of 37.18% of the dissimilarity, were *Nutricola tantilla* (a small bivalve found predominantly at Site 1), *Praxillella gracilis* (a bamboo worm found predominantly at Site 1), *Sternaspis fossor* (a dumbbell worm found predominantly at Site 1), and *Nuculana minuta* (a small bivalve found predominantly at Site 1).

Table 5. Species with significant contributions to the dissimilarity of samples from Sites 1 and 2.

Taxon	Contribution	Cumulative %	Mean abundance at Site 1	Mean abundance at Site 2
Nutricola tantilla	13.26	16.47	23	0.6
Praxillella gracilis	5.865	23.76	11.8	3
Sternaspis fossor	5.523	30.62	11	2
Nuculana minuta	5.283	37.18	11	0.6
Acila castrensis	3.694	41.77	7.8	1.6
Ophiura luetkeni	3.337	45.91	0	5.6
Nereis zonata	3.097	49.76	6.4	2
Polycirrus sp.	2.866	53.32	3.6	5.2
Amphioplus strongyloplax	2.376	56.27	0	3.4
Dentalium rectius	2.37	59.21	0.2	3.2
Euclymene zonalis	2.277	62.04	0	3.2
Amphiodia urtica	2.176	64.74	0	3.2
Nephtys ferruginea	2.17	67.44	3.2	1.2
Platynereis bicanaliculata	1.568	69.39	0	2.2
Saxidomus gigantea	1.479	71.22	1.8	0.2
Tellina carpenteri	1.46	73.04	3.2	0.8
Scoloplos acmeceps	1.46	74.85	2	1.4
Nutricola lordi	1.269	76.43	2.2	0
Yoldia scissurata	1.201	77.92	1.4	2.2
Dentalium pretiosum	1.081	79.26	0	1.8
Molpadia intermedia	0.9434	80.43	0	1.4

A number of species were unique to either Site 1 or Site 2. These species are listed in Table 6 below. Fourteen species were unique to Site 1 and 29 species were unique to Site 2.

Table 6. Species found uniquely at only one site.

Taxon	Unique Location
Nutricola lordi	Site 1
Abarenicola pacifica	Site 1
Nephtys cornuta	Site 1
Diastylis sp.	Site 1
Nereis vexillosa	Site 1
Ceratonereis paucidentata	Site 1
Aricidea sp.	Site 1
Micropodarke dubia	Site 1
Ophelina acuminata	Site 1
Cossura pygodactylata	Site 1
Lysianassidae	Site 1
Ophiura leptoctenia	Site 1
Lacuna vincta	Site 1
Protula pacifica	Site 1
Ophiura luetkeni	Site 2
Amphioplus strongyloplax	Site 2
Euclymene zonalis	Site 2
Amphiodia urtica	Site 2
Platynereis bicanaliculata	Site 2
Dentalium pretiosum	Site 2
Molpadia intermedia	Site 2
Amphisamytha bioculata	Site 2
Scalibregma inflatum	Site 2
Arabella iricolor	Site 2
Cyphocaris challengeri	Site 2
Pholoe caeca	Site 2
Neoamphitrite robusta	Site 2
Pinnixa occidentalis	Site 2
Megayoldia thraciaeformis	Site 2
Drilonereis falcata	Site 2
Holmesiella anomala	Site 2
Lumbrineris luti	Site 2
Bittium munitum	Site 2
Olivella baetica	Site 2
Dodecaceria concharum	Site 2
Munida quadrispina	Site 2
Synchirus gilli	Site 2
Sigalion sp.	Site 2
Pectinaria granulata	Site 2
Opalia borealis	Site 2
Cyclocardia ventricosa	Site 2
Rocinela belliceps	Site 2
Amphiodia periercta	Site 2

2.4 Other Observations

While not part of the formal macroinvertebrate baseline study, several macroinvertebrates not included in the species lists for Sites 1 and 2 were observed during the grab sampling for chemistry samples at Site 2.

i. *Aphrocallistes vastus*

At station S2-outside (see Figure 7), the sediment in the grab sample consisted of approximatey 25% dead Hexactinellid sponge fragments. A sample of this material was taken and later identified in the laboratory as *Aphrocallistes vastus*. While no living sponge was collected by the grab, the large amount of sponge debris suggests that living sponges must be occurring in close proximity to the grab station.

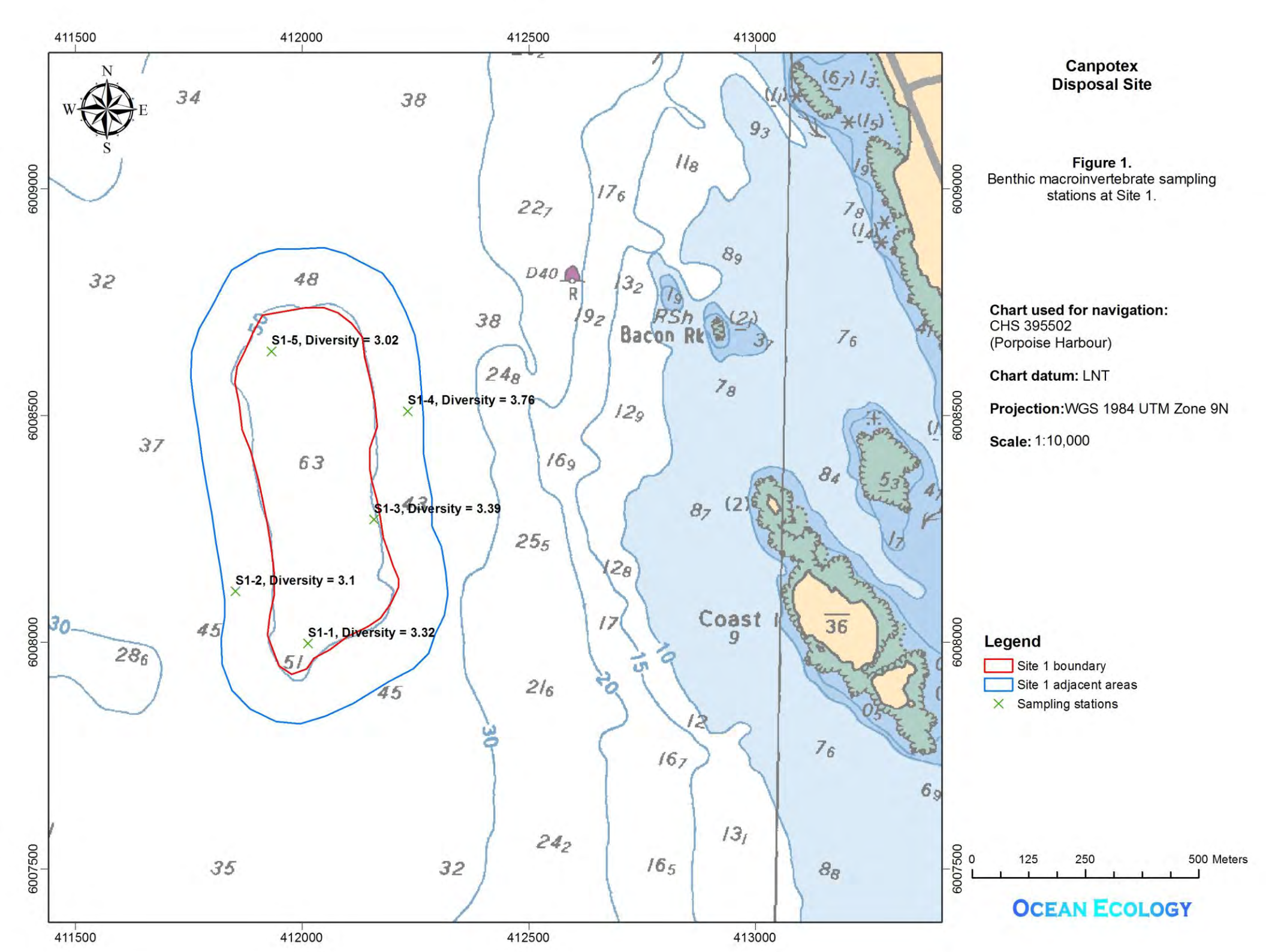
ii. *Brisaster latifrons*

At station S2-16 (see Figure 7), a heart urchin (*Brisaster latifrons*) was collected by the Ponar grab (see image below).

iii. *Pagurus sp*.

At station S2outside-23 (see Figure 7), a hermit crab, possibly *Pagurus dalli*, was brought up with the sediment sample (see image below).

3. Figures


411500
412000
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413000
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6008500
6008000
6007500
N
S
E
W
S1-5, Diversity = 3.02
S1-4, Diversity = 3.76
S1-3, Diversity = 3.39
S1-2, Diversity = 3.1
S1-1, Diversity = 3.32
D40
R
Bacon Rk
RSh
Coast
Canpotex
Disposal Site
Figure 1.
Benthic macroinvertebrate sampling stations at Site 1.
Chart used for navigation:
CHS 395502
(Porpoise Harbour)
Chart datum: LNT
Projection:WGS 1984 UTM Zone 9N
Scale: 1:10,000
Legend
Site 1 boundary
Site 1 adjacent areas
Sampling stations
0
125
250
500 Meters
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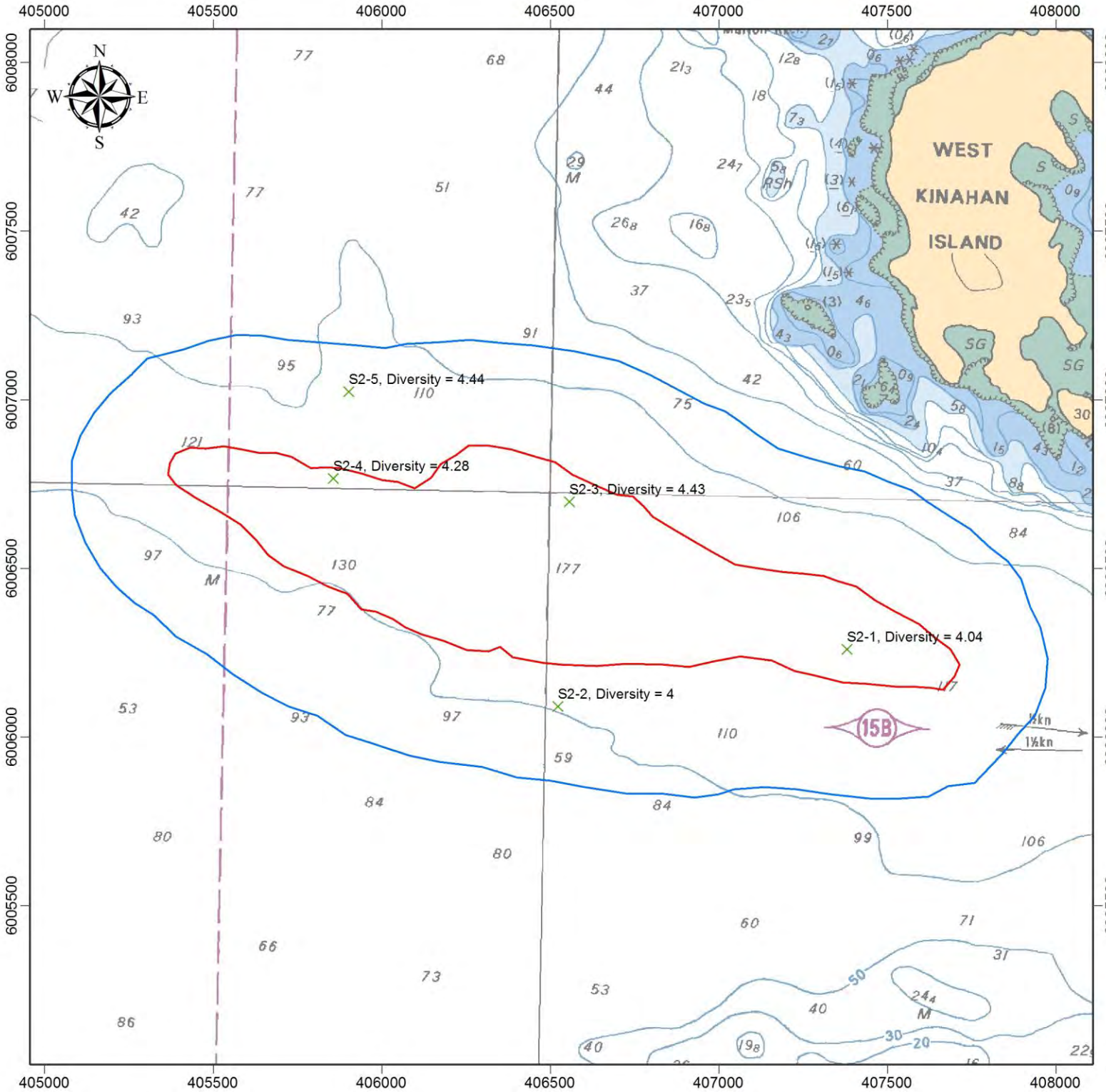

Canpotex Disposal Site

Figure 2.
Benthic macroinvertebrate sampling stations at Site 2.

Chart used for navigation:
CHS 395502
(Porpoise Harbour)

Chart datum: LNT

Projection:WGS 1984 UTM Zone 9N

Scale: 1:16,000

Legend

- Site 2 boundary
- Site 2 adjacent areas
- Sampling stations

0 125 250 500 Meters

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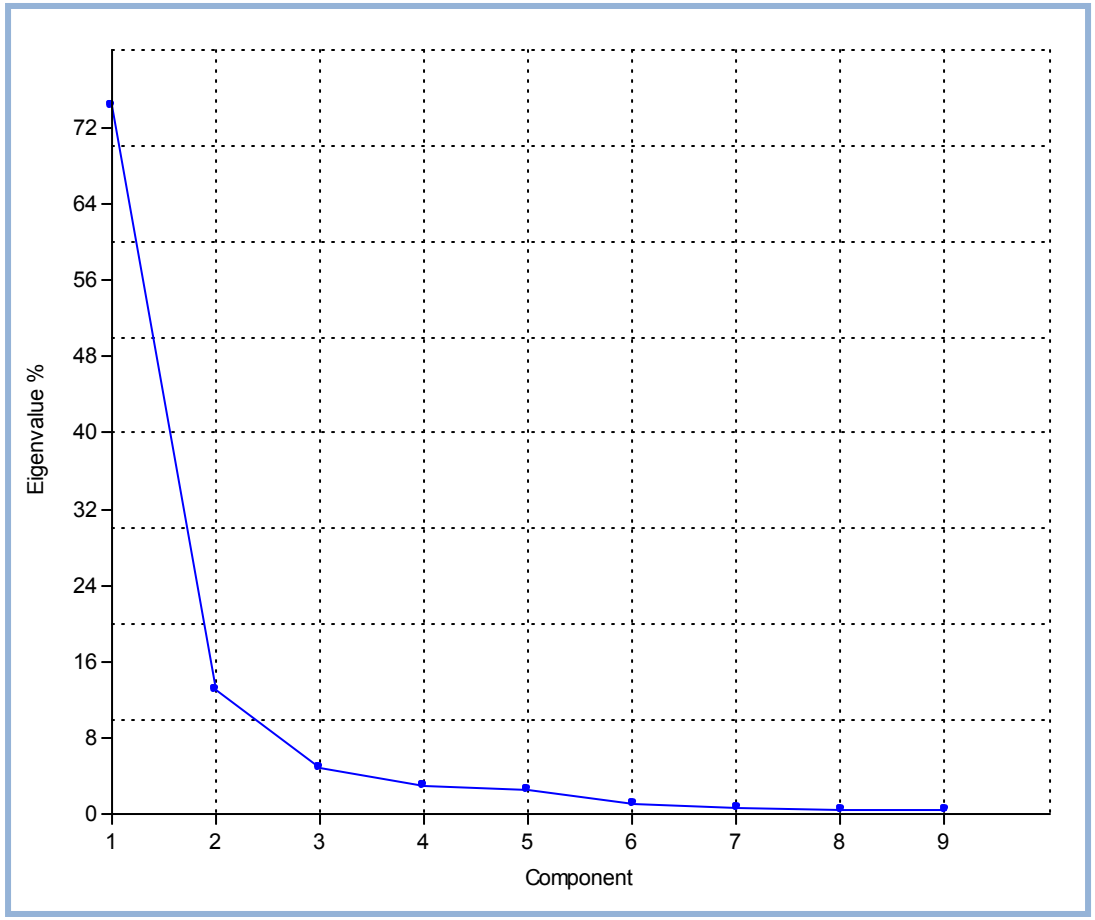


Figure 3. Scree plot.

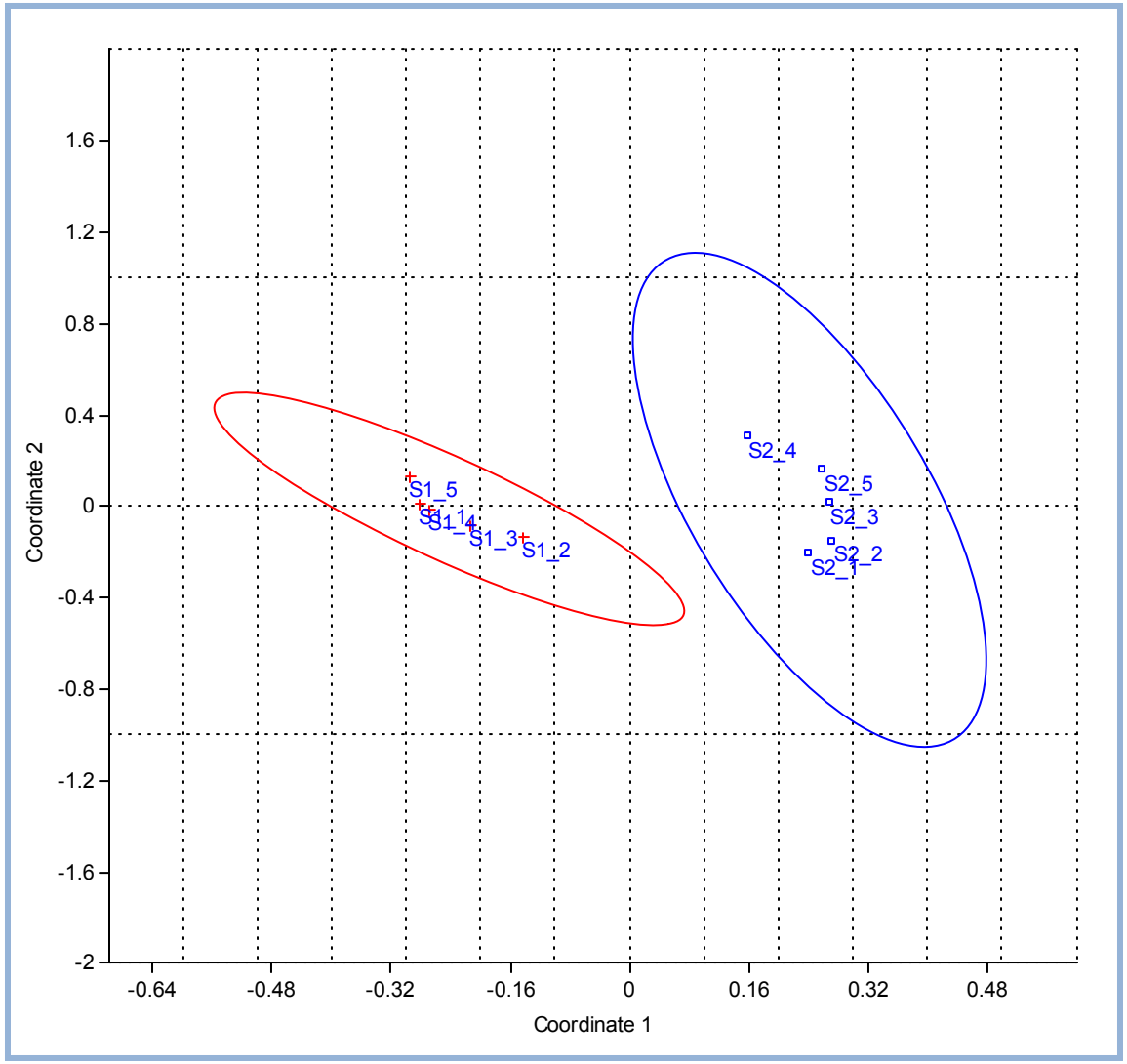


Figure 4. Multidimensional scaling plot.

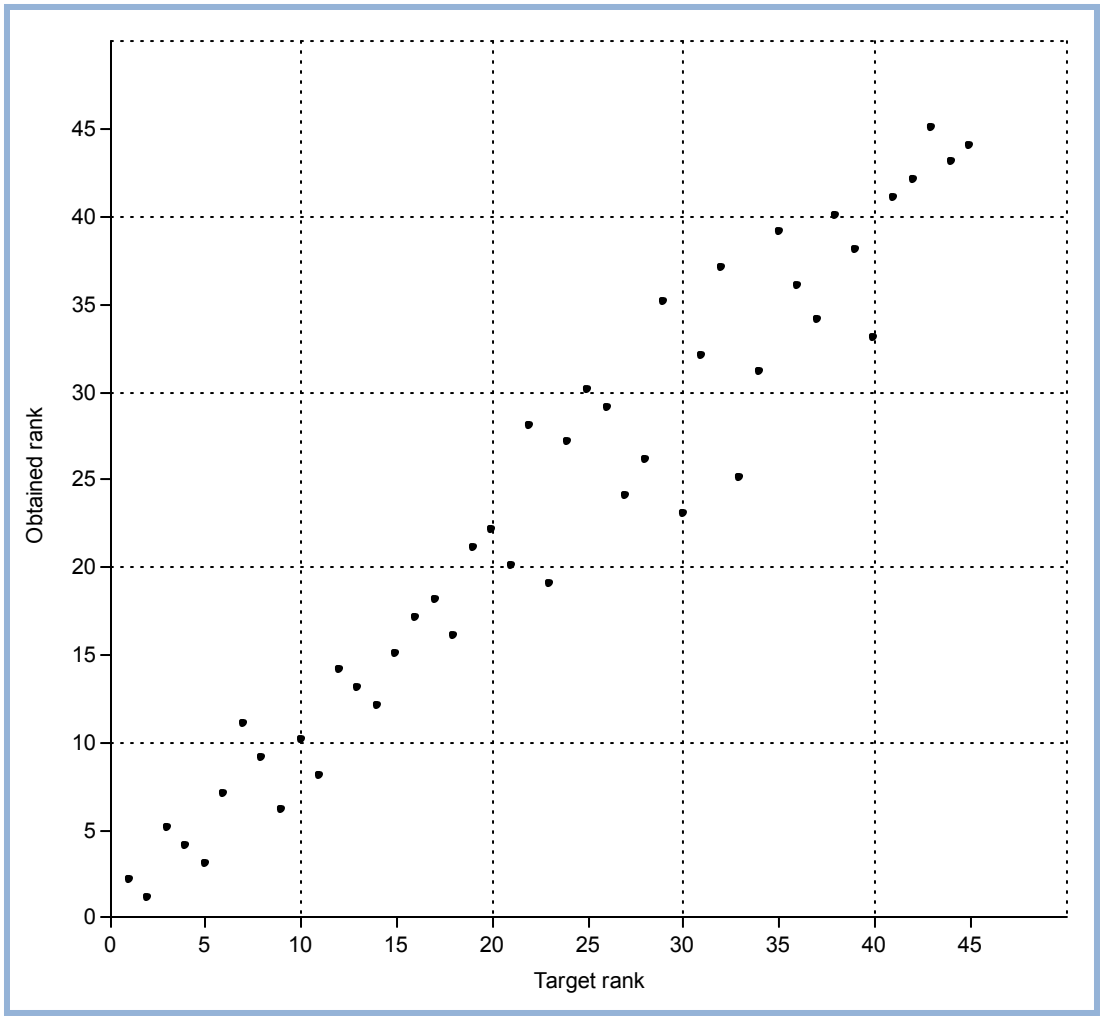


Figure 5. Shepard plot.

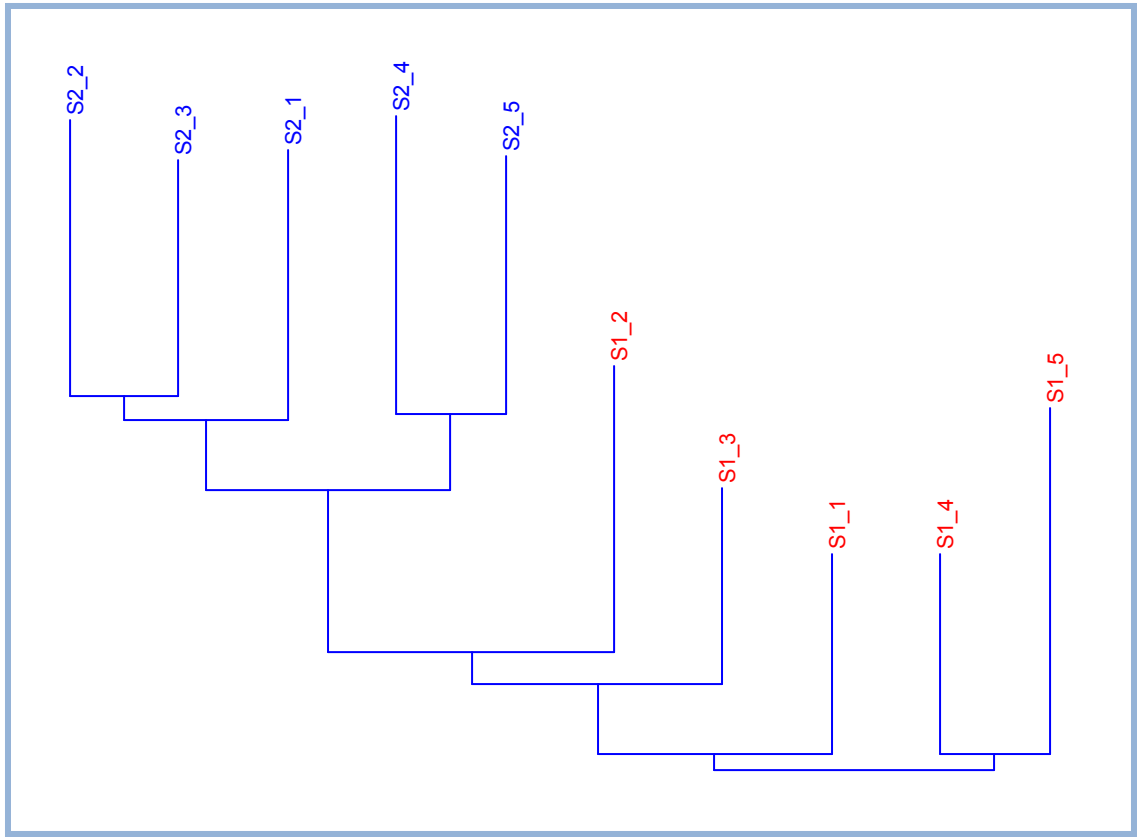
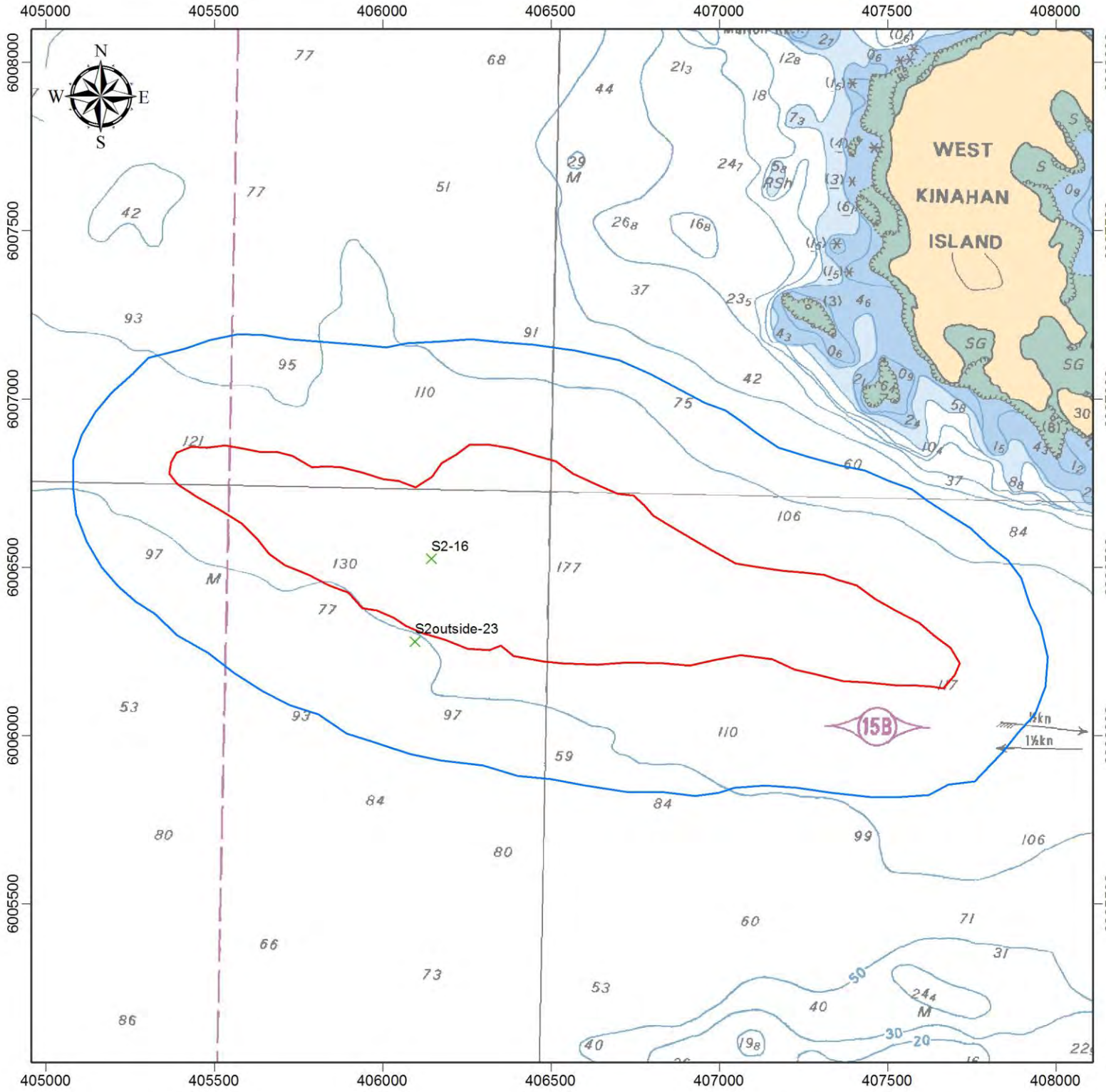


Figure 6. Dendrogram of similarity values for macroinvertebrates.



Canpotex Disposal Site

Figure 7.
Observations of macroinvertebrates during chemistry sampling at Site 2.

Chart used for navigation:
CHS 395502
(Porpoise Harbour)

Chart datum: LNT

Projection:WGS 1984 UTM Zone 9N

Scale: 1:16,000

Legend

- Site 2 boundary
- Site 2 adjacent areas
- Other observations

0 125 250 500 Meters

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4. Disclaimer

The findings presented in this report are based upon data collected during the day November 21st, 2010 using the methodology described in the Survey Methodology section of this report. Ocean Ecology has exercised reasonable skill, care, and diligence to collect and interpret the data, but makes no guarantees or warranties as to the accuracy or completeness of this data.

This report has been prepared solely for the use of Stantec pursuant to the agreement between Ocean Ecology and Stantec. Any use which other parties make of this report, or any reliance on or decisions made based on it, are the responsibility of such parties. Ocean Ecology accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this report.

Any questions concerning the information or its interpretation should be directed to the undersigned.

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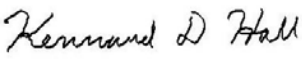
Reviewed By:



Kennard Hall, Captain
Partner, Ocean Ecology

Appendix 1 - Raw Data

Sample Date:	21/11/2010		**Definitions**		
Sample Time:	10:03		**Sampl**		
Sample No.:	S1-1		1	Petit Ponar grab	
Location Name:	Canpotex Site 1, inside		2	Standard Ponar grab	
Latitude:	54.21242		3	K-B corer	
Longitude:	-130.3492133				
Weather conditions:	Clear, light wind, 2' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):	56		2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:			3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	2		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):	14.0		**Biolog**		
Anoxic layer (black):	2		1	None	
Maximum penetration depth (nearest 0.5 cm):	15.0		2	Shells	
Sample quality:	1		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:	4 L sample		5	Macrophytes	
			6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mullusca	0	Polychaete	0	Echinoderm	0	Crustacea	0		0		0		0		0
Nuculana minuta	8	Sternaspis fossor	12	Ophiura leptoctenia	1	Lysianassidae	1		0		0		0		0
Nutricola tantilla	20	Polycirrus sp.	2		0		0		0		0		0		0
Diplodonta orbella	1	Abarenicola pacifica	4		0		0		0		0		0		0
Tellina modesta	4	Praxillella gracilis	14		0		0		0		0		0		0
Tellina carpenteri	1	Ceratonereis paucidentata	2		0		0		0		0		0		0
Acila castrensis	1	Nereis zonata	6		0		0		0		0		0		0
Euspira lewisii	1		0		0		0		0		0		0		0
Astyris gausapata	1		0		0		0		0		0		0		0
Nutricola lordi	2		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	39	Total	40	Total	1	Total	1		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	17														
Shannon's diversity index:	3.3242														
Simpson's diversity index	8.0000														

Sample Date:	21/11/2010		**Definitions**		
Sample Time:	10:22		**Sampl**		
Sample No.:	S1-2		1	Petit Ponar grab	
Location Name:	Canpotex Site 1, outside		2	Standard Ponar grab	
Latitude:	54.21343		3	K-B corer	
Longitude:	-130.3516983				
Weather conditions:	Clear, light wind, 2' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):			2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:	48		3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	2		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):	13.0		**Biolog**		
Anoxic layer (black):	1		1	None	
Maximum penetration depth (nearest 0.5 cm):	13.0		2	Shells	
Sample quality:	1		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:	4 L sample		5	Macrophytes	
			6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mollusca	0	*Polychaete*	0		0		0		0		0		0		0
Nuculana minuta	1	*Sternaspis fossor*	6		0		0		0		0		0		0
Nutricola tantilla	9	*Nephtys ferruginea*	4		0		0		0		0		0		0
Saxidomus gigantea	5	*Micropodarke dubia*	1		0		0		0		0		0		0
	0	*Aricidea sp.*	1		0		0		0		0		0		0
	0	*Nereis vexillosa*	2		0		0		0		0		0		0
	0	*Nereis zonata*	2		0		0		0		0		0		0
	0	*Polycirrus sp.*	9		0		0		0		0		0		0
	0	*Praxillella gracilis*	6		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	15	*Total*	31		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	11														
Shannon's diversity index:	3.0956														
Simpson's diversity index	8.6250														

Sample Date:	21/11/2010		**Definitions**		
Sample Time:	10:37		**Sampl**		
Sample No.:	S1-3		1	Petit Ponar grab	
Location Name:	Canpotex Site 1, inside		2	Standard Ponar grab	
Latitude:	54.21490667		3	K-B corer	
Longitude:	-130.3470517				
Weather conditions:	Clear, light wind, 1' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):	55		2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:			3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	2		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):	15.0		**Biolog**		
Anoxic layer (black):	1		1	None	
Maximum penetration depth (nearest 0.5 cm):	15.0		2	Shells	
Sample quality:	1		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:	4 L sample		5	Macrophytes	
			6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mollusca	0	*Polychaete*	0		0		0		0		0		0		0
Nuculana minuta	5	*Sternaspis fossor*	7		0		0		0		0		0		0
Nutricola tantilla	12	*Polycirrus sp.*	2		0		0		0		0		0		0
Saxidomus gigantea	1	*Praxillella gracilis*	6		0		0		0		0		0		0
Tellina carpenteri	2	*Nereis zonata*	7		0		0		0		0		0		0
Yoldia scissurata	2	*Ophelina acuminata*	1		0		0		0		0		0		0
Acteocina eximia	1	*Nephtys cornuta*	3		0		0		0		0		0		0
Dentalium rectius	1	*Glycera capitata*	1		0		0		0		0		0		0
	0	*Travisia pupa*	1		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	24	*Total*	28		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	15														
Shannon's diversity index:	3.3890														
Simpson's diversity index	9.5396														

Sample Date:	21/11/2010		**Definitions**		
Sample Time:	10:52		**Sampl**		
Sample No.:	S1-4		1	Petit Ponar grab	
Location Name:	Canpotex Site 1, outside		2	Standard Ponar grab	
Latitude:	54.21706667		3	K-B corer	
Longitude:	-130.3459867				
Weather conditions:	Clear, light wind, 1' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):	51		2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:			3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	2		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):	14.0		**Biolog**		
Anoxic layer (black):	1		1	None	
Maximum penetration depth (nearest 0.5 cm):	14.0		2	Shells	
Sample quality:	1		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:	4 L sample		5	Macrophytes	
			6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mollusca	0	*Polychaete*	0	*Crustacean*	0		0		0		0		0		0
Nuculana minuta	4	*Sternaspis fossor*	13	*Diastylis sp.*	1		0		0		0		0		0
Nutricola tantilla	27	*Nephtys ferruginea*	11		0		0		0		0		0		0
Saxidomus gigantea	3	*Amage anops*	2		0		0		0		0		0		0
Nutricola lordi	7	*Praxillella gracilis*	6		0		0		0		0		0		0
Tellina carpenteri	5	*Eteone longa*	4		0		0		0		0		0		0
Yoldia scissurata	1	*Polycirrus sp.*	4		0		0		0		0		0		0
Acteocina eximia	1	*Nereis zonata*	10		0		0		0		0		0		0
Euspira lewisii	1	*Scoloplos acmeceps*	5		0		0		0		0		0		0
Astyris gausapata	1	*Travisia pupa*	1		0		0		0		0		0		0
Lacuna vincta	1	*Protula pacifica*	1		0		0		0		0		0		0
	0	*Diplocirrus sp.*	3		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	51	*Total*	60	*Total*	1		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	22														
Shannon's diversity index:	3.7569														
Simpson's diversity index	10.1902														

Sample Date:	21/11/2010		**Definitions**		
Sample Time:	11:11		**Sampl**		
Sample No.:	S1-5		1	Petit Ponar grab	
Location Name:	Canpotex Site 1, inside		2	Standard Ponar grab	
Latitude:	54.21820167		3	K-B corer	
Longitude:	-130.3506267				
Weather conditions:	Clear, light wind, 1' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):	60		2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:			3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	2		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):	15.0		**Biolog**		
Anoxic layer (black):	1		1	None	
Maximum penetration depth (nearest 0.5 cm):	15.0		2	Shells	
Sample quality:	1		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:	5 L sample		5	Macrophytes	
			6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mollusca	0	*Polychaete*	0		0		0		0		0		0		0
Nuculana minuta	37	*Sternaspis fossor*	17		0		0		0		0		0		0
Nutricola tantilla	47	*Nephtys ferruginea*	1		0		0		0		0		0		0
Nutricola lordi	2	*Praxillella gracilis*	27		0		0		0		0		0		0
Tellina carpenteri	8	*Nereis zonata*	7		0		0		0		0		0		0
Yoldia scissurata	4	*Polycirrus sp.*	1		0		0		0		0		0		0
Acila castrensis	38	*Scoloplos acmeceps*	5		0		0		0		0		0		0
	0	*Tomopteris cavalli*	1		0		0		0		0		0		0
	0	*Cossura pygodactylata*	2		0		0		0		0		0		0
	0	*Eteone longa*	1		0		0		0		0		0		0
	0	*Diplocirrus sp.*	1		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	136	*Total*	63		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	16														
Shannon's diversity index:	3.0217														
Simpson's diversity index	6.5583														

Sample Date:	21/11/2010		**Definitions**		
Sample Time:	11:54		**Sampl**		
Sample No.:	S2-1		1	Petit Ponar grab	
Location Name:	Canpotex Site 2, inside		2	Standard Ponar grab	
Latitude:			3	K-B corer	
Longitude:					
Weather conditions:	Clear, light wind, 3' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):			2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:			3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	1		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):			**Biolog**		
Anoxic layer (black):	1		1	None	
Maximum penetration depth (nearest 0.5 cm):	15.0		2	Shells	
Sample quality:	1		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:	6 L sample		5	Macrophytes	
			6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mollusca	0	Polychaete	0	Crustacean	0	Echinoderm	0	Chordate	0		0		0		0
Nutricola tantilla	1	Sternaspis fossor	6	Diastylis sp.	1	Molpadia intermedia	2	Synchirus gilli	1		0		0		0
Yoldia scissurata	4	Pectinaria granulata	1	Cyphocaris challengeri	1	Ophiura luetkeni	2		0		0		0		0
Tellina modesta	1	Neoamphitrite robusta	2		0	Amphioplus strongyloplax	1		0		0		0		0
Dentalium rectius	3	Amphisamytha bioculata	1		0		0		0		0		0		0
Opalia borealis	1	Arabella incolor	1		0		0		0		0		0		0
	0	Scalibregma inflatum	2		0		0		0		0		0		0
	0	Euclymene zonalis	5		0		0		0		0		0		0
	0	Polycirrus sp.	14		0		0		0		0		0		0
	0	Scoloplos acmeceps	2		0		0		0		0		0		0
	0	Eteone longa	1		0		0		0		0		0		0
	0	Tomopteris cavalli	1		0		0		0		0		0		0
	0	Travisia pupa	2		0		0		0		0		0		0
	0	Nereis zonata	1		0		0		0		0		0		0
	0	Sigalion sp.	1		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	10	Total	40	Total	2	Total	5	Total	1		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	25														
Shannon's diversity index:	4.0446														
Simpson's diversity index	12.6183														

Sample Date:	21/11/2010		**Definitions**		
Sample Time:	12:13		**Sampl**		
Sample No.:	S2-2		1	Petit Ponar grab	
Location Name:	Canpotex Site 2, outside		2	Standard Ponar grab	
Latitude:			3	K-B corer	
Longitude:					
Weather conditions:	Clear, light wind, 3' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):			2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:			3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	1		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):			**Biolog**		
Anoxic layer (black):	1		1	None	
Maximum penetration depth (nearest 0.5 cm):	14.0		2	Shells	
Sample quality:	1		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:	4 L sample		5	Macrophytes	
			6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mollusca	0	*Polychaete*	0	*Crustacean*	0	*Echinoderm*	0		0		0		0		0
Yoldia scissurata	1	*Sternaspis fossor*	3	*Holmesiella anomala*	1	*Amphioplus strongyloplax*	4		0		0		0		0
Tellina carpenteri	1	*Euclymene zonalis*	1		0	*Amphiodia urtica*	2		0		0		0		0
Nuculana minuta	1	*Travisia pupa*	1		0	*Ophiura luetkeni*	1		0		0		0		0
Dentalium rectius	6	*Platynereis bicanaliculata*	1		0		0		0		0		0		0
Olivella baetica	1	*Arabella iricolor*	1		0		0		0		0		0		0
	0	*Nereis zonata*	1		0		0		0		0		0		0
	0	*Scalibregma inflatum*	2		0		0		0		0		0		0
	0	*Polycirrus sp.*	3		0		0		0		0		0		0
	0	*Amphisamytha bioculata*	1		0		0		0		0		0		0
	0	*Tomopteris cavalli*	1		0		0		0		0		0		0
	0	*Scoloplos acmeceps*	1		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	10	*Total*	16	*Total*	1	*Total*	7		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	20														
Shannon's diversity index:	3.9987														
Simpson's diversity index	19.3448														

Sample Date:	21/11/20010		**Definitions**		
Sample Time:	13:08		**Sampl**		
Sample No.:	S2-3		1	Petit Ponar grab	
Location Name:	Canpotex Site 2, inside		2	Standard Ponar grab	
Latitude:			3	K-B corer	
Longitude:					
Weather conditions:	Clear, light wind, 3' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):			2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:			3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	1		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):			**Biolog**		
Anoxic layer (black):	1		1	None	
Maximum penetration depth (nearest 0.5 cm):	15.0		2	Shells	
Sample quality:	2		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:			5	Macrophytes	
	Grab completely full; may have been some extrusion from screens; 6L sample		6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mollusca	0	*Polychaete*	0	*Crustacean*	0	*Echinoderm*	0		0		0		0		0
Yoldia scissurata	3	*Sternaspis fossor*	1	*Munida quadrispina*	1	*Molpadia intermedia*	1		0		0		0		0
Nutricola tantilla	2	*Amphisamytha bioculata*	1	*Cyphocaris challengeri*	1	*Amphioplus strongyloplax*	2		0		0		0		0
Dentalium pretiosum	2	*Platynereis bicanaliculata*	4		0	*Amphiodia urtica*	3		0		0		0		0
Dentalium rectius	6	*Nephtys ferruginea*	1		0	*Ophiura luetkeni*	2		0		0		0		0
Tellina carpenteri	1	*Scoloplos acmeceps*	3		0		0		0		0		0		0
Tellina modesta	1	*Neoamphitrite robusta*	1		0		0		0		0		0		0
Megayoldia thraciaeformis	2	*Amage anops*	1		0		0		0		0		0		0
Euspira lewisii	1	*Euclymene zonalis*	5		0		0		0		0		0		0
	0	*Nereis zonata*	6		0		0		0		0		0		0
	0	*Arabella iricolor*	1		0		0		0		0		0		0
	0	*Tomopteris cavalli*	1		0		0		0		0		0		0
	0	*Polycirrus sp.*	2		0		0		0		0		0		0
	0	*Dodecaceria concharum*	1		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	18	*Total*	28	*Total*	2	*Total*	8		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	27														
Shannon's diversity index:	4.4343														
Simpson's diversity index	25.2459														

Sample Date:	21/11/2010		**Definitions**		
Sample Time:	13:44		**Sampl**		
Sample No.:	S2-4		1	Petit Ponar grab	
Location Name:	Canpotex Site 2, inside		2	Standard Ponar grab	
Latitude:			3	K-B corer	
Longitude:					
Weather conditions:	Clear, light wind, 3' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):			2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:			3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	1		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):			**Biolog**		
Anoxic layer (black):	1		1	None	
Maximum penetration depth (nearest 0.5 cm):	15.0		2	Shells	
Sample quality:	1		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:	5 L sample		5	Macrophytes	
			6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mollusca	0	Polychaete	0	Crustacean	0	Echinoderm	0		0		0		0		0
Yoldia scissurata	2	Scalibregma inflatum	1	Pinnixa occidentalis	1	Molpadia intermedia	2		0		0		0		0
Dentalium pretiosum	6	Praxillella gracilis	10	Rocinela belliceps	1	Amphioplus strongyloplax	6		0		0		0		0
Nuculana minuta	2	Euclymene zonalis	2	Cyphocaris challengeri	1	Amphiodia urtica	6		0		0		0		0
Acila castrensis	8	Amphisamytha bioculata	2		0	Ophiura luetkeni	20		0		0		0		0
Astyris gausapata	6	Arabella iricolor	1		0	Amphiodia periercta	1		0		0		0		0
Saxidomus gigantea	1	Drilonereis falcata	2		0		0		0		0		0		0
Megayoldia thraciaeformis	1	Polycirrus sp.	5		0		0		0		0		0		0
Tellina carpenteri	1	Nephtys ferruginea	3		0		0		0		0		0		0
Tellina modesta	1	Amage anops	1		0		0		0		0		0		0
Bittium munitum	1	Glycera capitata	1		0		0		0		0		0		0
Cyclocardia ventricosa	1	Platynereis bicanaliculata	2		0		0		0		0		0		0
	0	Travisia pupa	4		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	30	Total	34	Total	3	Total	35		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	31														
Shannon's diversity index:	4.2797														
Simpson's diversity index	14.7593														

Sample Date:	21/11/2010		**Definitions**		
Sample Time:	14:11		**Sampl**		
Sample No.:	S2-5		1	Petit Ponar grab	
Location Name:	Canpotex Site 2, outside		2	Standard Ponar grab	
Latitude:			3	K-B corer	
Longitude:					
Weather conditions:	Clear, light wind, 3' swell		**Sedim**		
Sample Type:	2		1	Silt/clay	
Depth from sounder (m):			2	Complex sediment, predominantly fine	
Characteristics of surficial sediment:			3	Sand	
Sediment type:	1		4	Complex sediment, predominantly sand/gravel	
Sediment color:	1		5	Gravel	
Biological structures:	4		6	Shell hash	
Debris:	1		**Sedim**		
Oily sheen:	1		1	Brown	
Odor:	1		2	Black	
Characteristics of vertical profile:			3	Red	
Oxic layer (brown):	2		4	Green	
Redox potential discontinuity (RPD) layer (grey):	1		5	Yellow	
Depth of RPD (if present) (nearest 0.5 cm):			**Biolog**		
Anoxic layer (black):	1		1	None	
Maximum penetration depth (nearest 0.5 cm):	15.0		2	Shells	
Sample quality:	1		3	Tubes	
Analyst:	Barb Faggetter		4	Worm holes	
Comments:	5 L sample		5	Macrophytes	
			6	Diatom mat	
			7	Bacterial mat	
			Debris		
			1	None	
			2	Macrophytes	
			3	Bark	
			4	Wood chips	
			5	Wood fibers	
			6	Anthropogenic debris	
			Oily		
			1	Absent	
			2	Present	
			Odor:		
			1	None	
			2	Sulfide	odor of rotten eggs
			3	Oily	odor of petroleum tar
			4	Humic	musty, organic odor
			Oxic l		
			1	Absent	
			2	Present	
			RPD		
			1	Absent	
			2	Present	
			Anoxi		
			1	Absent	
			2	Present	
			Sampl		
			1	Good	
			2	Sediment extruded through upper surface of grab	
			3	Leakage	
			4	Surface canted	
			5	Sediment washed or winnowed	

Mollusca	0	*Polychaete*	0	*Crustacean*	0	*Echinoderm*	0		0		0		0		0
Yoldia scissurata	1	*Praxillella gracilis*	5	*Pinnixa occidentalis*	2	*Molpadia intermedia*	2		0		0		0		0
Dentalium pretiosum	1	*Euclymene zonalis*	3	*Holmesiella anomala*	1	*Amphioplus strongyloplax*	4		0		0		0		0
Dentalium rectius	1	*Nephtys ferruginea*	2	*Cyphocaris challengeri*	1	*Amphiodia urtica*	5		0		0		0		0
Tellina carpenteri	1	*Amphisamytha bioculata*	1		0	*Ophiura luetkeni*	3		0		0		0		0
Astyris gausapata	1	*Platynereis bicanaliculata*	4		0		0		0		0		0		0
Acteocina eximia	1	*Scoloplos acmeceps*	1		0		0		0		0		0		0
Diplodonta orbella	1	*Drilonereis falcata*	1		0		0		0		0		0		0
Bittium munitum	1	*Pholoe caeca*	3		0		0		0		0		0		0
	0	*Lumbrineris luti*	2		0		0		0		0		0		0
	0	*Nereis zonata*	2		0		0		0		0		0		0
	0	*Polycirrus sp.*	2		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total	8	*Total*	26	*Total*	4	*Total*	14		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
	0		0		0		0		0		0		0		0
Total number of species:	26														
Shannon's diversity index:	4.4411														
Simpson's diversity index	28.2128														