



Summary of post-remediation contaminant monitoring of sediments and shellfish from estuarine areas adjacent to the former Fruitgrowers Chemical Company (FCC) site, Mapua, Nelson (2019)

Reference:

Davidson, R.J.; Rayes, C.; T. Scott-Simmonds 2019. Summary of post-remediation contaminant monitoring of sediments and shellfish from estuarine areas adjacent to the former Fruitgrowers Chemical Company (FCC) site, Mapua, Nelson (2019). Prepared by Davidson Environmental Ltd. for Tasman District Council. Survey and monitoring report no. 935.

**Prepared by Davidson Environmental Limited for:
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**Samples collected by Rob Davidson, Courtney Rayes, Tom Scott-Simmonds
Laboratory analysis by Hills Laboratories.**

March 2019

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1.0 Introduction

Following the completion of the remediation project, marine sediments and biota adjacent to the former Fruitgrowers Chemical Company (FCC) have been regularly sampled (Davidson *et al.*, 2010; 2011; 2012; 2016) with samples collected by TDC staff in 2013, 2014 and 2015.

Sampling of sediments and shellfish were also collected on the 28th May 2018 by Davidson Environmental Limited and a small summary document produced for TDC.

The present summary document presents data collected on the 7 March 2019 by Davidson Environmental Limited. Hills laboratory data for 2018 and 2019 are presented in Appendices 1-4.

Data includes:

- Contaminant levels in sediments (shallow 0-2 cm, deep 6-10 cm);
- Contaminant levels in mollusc species (mudflat snail, topshell snail, cockle);

2.0 Methods

For details of sample sites and methodologies, refer to Davidson and Sheldon (2016). The same sites, sampling methods, target contaminants and analyses used by Davidson and Sheldon (2016) were adopted during the present sampling event.

3.0 Summary of results

3.1 Sediment contamination

A summary of contaminant data collected in 2019 are shown in Tables 1 to 3.

3.1.1 ADL (Aldrin, Dieldrin, Lindane)

Surface sediments

Aside from western FCC stream sites, no surface sediment sites were over the Soil Acceptance Criteria (SAC) for ADL (Aldrin, Dieldrin, Lindane) in 2019 (Table 1). Three impact sites showed small increases from 2015 values, but these sites remained under the SAC.

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Of the stream sites, the West FCC stream 1 lower and upper sites slightly decreased compared to 2015, while middle stream sites increased slightly in 2019 compared to 2015 (Table 1). These variations may reflect contaminant patchiness rather than increases or decreases in contaminant levels.

Deep sediments

Deep sediments exceeded SAC levels for ADL at two West FCC, two East FCC sites and all stream sites in 2019. Four increases compared to 2015 data were recorded in 2019 (Table 2). The only large increase was observed from an East FCC site (JME 087 where values climbed to exceed the SAC.

Two stream sites declined in 2019 compared to 2015, while one site (lower) increased slightly (Table 2).

3.1.2 DDX

Shallow sediments

The SAC for DDX was exceeded at all but two surface impact sites in 2019, however, contaminant levels declined at all, but one surface sites compared to 2015 (Table 1). An increase occurred at West FCC new 1 rising from 0.0363 to 0.098 mg/kg. (Table 1).

DDX from shallow stream sites remained above the SAC in 2019 with the middle site showing highest values (Table 1)

Deep sediments

Most deep West FCC sediment samples showed declines in DDX compared to 2015 samples, along with all West FCC stream sites (Table 2). Small increases from 2015 to 2019 were recorded at 5 sites.

The West FCC stream 2 (middle) site continues to show highest DDX levels for the deep strata, with a decrease recorded in 2019 compared to 2015 and 2018 (Table 2). The West FCC stream 3 (upper) site declined compared to 2015 but was above the 2018 value (0.72 mg/kg).

No elevated ADL or DDX values were recorded from control sites at either depth strata.

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3.2 Shellfish and snail contaminant levels

In 2014 and 2015, ADL and DDX levels for the cockle (*Austrovenus stutchburyi*) at the East FCC shore reached an all-time low. In 2018 ADL and DDX levels remained low for cockles. In 2019 cockle ADL and DDX remained low. Cockle contaminants at the control site remained low and consistent with previous sample years (Table 3).

ADL and DDX levels in mudflat snails (*Amphibola crenata*) revealed contamination as did samples collected from 2009 to 2015 and in 2018 (Table 3). Values appear to have remained relatively consistent for mudflat snails at both West FCC and East FCC sites.

In 2015, contaminant levels in topshell (*Diloma subrostrata*) were low. Results from the present sample showed a small increase from 2015 levels, but comparable to 2018 contaminant levels (Table 3).

Table 1. Summary of shallow sediment ADL (Aldrin, Dieldrin, Lindane) and DDX, levels from surface samples collected at all sites in 2019 and status of increase (pink) and decline (green) compared to 2015 results. Orange cells highlight values exceeding Soil Acceptance Criteria (SAC)

SURFACE (0 - 2 cm)	West Control	West FCC JME 083	West FCC JME 081	West FCC JME 082	West FCC new1 (west)	West FCC new2 (middle)	West FCC new3 (east)	West FCC JME 084	East FCC JME 088	East FCC JME 087	East FCC JME 086	East FCC new1 (north)	East FCC new2 (south)	East FCC JME 090	East Control	West FCC Stream1 (low)	West FCC Stream2 (middle)	West FCC Stream3 (upper)	
ADL (2015)	0.01	0.005	0.0089	0.0024	0.001	0.002	0.0081	0.0015	0.0052	0.0018	0.0143	0.0015	0.0125	0.0016	0.0017	0.0015	0.0134	0.0694	0.036
ADL (2019)	0.01	0.0015	0.0068	0.0015	0.0036	0.0015	0.0015	0.0015	0.0015	0.0029	0.0041	0.0015	0.002	0.0015	0.0021	0.0015	0.0086	0.0875	0.033
2015 to 2019	0.01	Decline	Decline	Decline	Increase	Decline	Decline	No change	Decline	Increase	Decline	No change	Decline	Decline	Increase	No change	Decline	Increase	Decline
DDX (2015)	0.01	0.005	0.42	0.1187	0.0363	0.0386	0.4619	0.0575	0.0694	0.1547	0.0711	0.0142	0.6257	0.0602	0.289	0.003	0.3194	1.543	0.6158
DDX (2019)	0.01	0.005	0.25	0.021	0.013	0.098	0.048	0.003	0.016	0.044	0.022	0.006	0.058	0.023	0.064	0.003	0.188	1.59	0.52
2015 to 2019	0.01	No change	Decline	Decline	Decline	Increase	Decline	Decline	Decline	Decline	Decline	Decline	Decline	Decline	Decline	No change	Decline	Increase	Decline

Table 2. Summary of deep sediment ADL (Aldrin, Dieldrin, Lindane) and DDX, levels from surface samples collected at all sites in 2019 and status of increase (pink) and decline (green) compared to 2015 results. Orange cells highlight values exceeding Soil Acceptance Criteria (SAC)

DEEP (6 - 10 cm)	West Control	West FCC JME 083	West FCC JME 081	West FCC JME 082	West FCC new1 (west)	West FCC new2 (middle)	West FCC new3 (east)	West FCC JME 084	East FCC JME 088	East FCC JME 087	East FCC JME 086	East FCC new1 (north)	East FCC new2 (south)	East FCC JME 090	East Control	West FCC Stream1 (low)	West FCC Stream2 (middle)	West FCC Stream3 (upper)	
ADL (2015)	0.01	0.005	0.0326	0.0082	0.0015	0.0015	0.0015	0.0015	0.0085	0.0144	0.0029	0.0052	0.0031	0.1338	0.003	0.0015	0.0158	0.1488	0.2423
ADL (2019)	0.01	0.0015	0.0124	0.0015	0.0015	0.0015	0.0021	0.0015	0.0115	0.0025	0.0983	0.0015	0.0045	0.0322	0.0037	0.0015	0.0172	0.1104	0.0274
2015 to 2019	0.01	Decline	Decline	Decline	No change	No change	Increase	No change	Increase	Decline	Increase	Decline	Increase	Decline	Increase	No change	Increase	Decline	Decline
DDX (2015)	0.01	0.005	1.136	0.474	0.0036	0.0068	0.0183	0.0036	0.2369	1.3631	0.0479	0.1501	0.5386	3.9559	0.1823	0.003	0.3752	5.744	3.486
DDX (2019)	0.01	0.005	0.75	0.052	0.0035	0.007	0.042	0.007	0.29	0.053	0.041	0.014	0.3	2.2	0.28	0.003	0.37	3.4	1.18
2015 to 2019	0.01	No change	Decline	Decline	Decline	Increase	Increase	Increase	Increase	Decline	Decline	Decline	Decline	Decline	Increase	No change	Decline	Decline	Decline

Table 3. ADL and DDX concentrations in mollusc species sampled from impact and control sites in 2018 and status of increase (pink), decline (green) and no change (blue) compared to 2015 results.

Location	West	West FCC	East FCC	East FCC	East FCC	East
Site	Control	JME 084	Composite	new2 (south)	New 2	Control
Species	Amphibola	Amphibola	Amphibola	Diloma	Cockle	Cockle
Substrata	Soft	Soft	Soft	Soft	Soft	Soft
ADL (aldrin, dieldrin, lindane)	0.00075	0.0295	0.0685	0.002	0.0073	0.00075
DDX	0.01725	1.1372	0.2621	0.0137	0.00195	0.0015

3.0 Patterns of contamination

3.1 Sediment

In the 2009 auditor's report, it was stated that the SAC for DDX and ADL in estuarine sediments was not met (Pattle Delamore, 2009). By 2018 and in the present sample most of the shallow and deep sediments (excluding the West FCC stream, JME 083, 084 and East FCC new 2 sites) met the SAC for ADL. DDX levels in 2019, however, remain above the SAC at most impact sites, however, levels for most sites are dramatically lower compared to 2015.

Based on results and trends, high contamination levels at stream sites remain a concern, however, 2019 data show values declined for all but three of the ADL and DDX contaminants for the three deep and three shallow samples. This variation may be due to contaminant patchiness in sediments.

Historically, sediment recontamination occurred in previous years and probably came from a "hot spot" in the adjacent land (Davidson and Sheldon, 2016). Some comfort is provided by the considerable decline in ADL and DDX at West FCC stream 3 (upper) from 2015 to 2018 and 2019. Based on 2015 results, Davidson and Sheldon (2016) suggested, "new contaminants have ceased, and the "hotspot" source may have stabilized as the auditor originally suggested may occur (Pattle Delamore, 2011)." The small increases observed in the present study likely represent normal site variability and are not indicative of an increase in contamination.

Overall contaminant levels at the stream sites, show the source may have stabilized, but elevated levels of contamination are still present.

3.2 Biota

Cockles contaminants at the East FCC have reached low levels in 2019.

ADL and DDX in mudflat snails remained above controls levels. For mudflat snails, ADL and DDX values have historically been very high. For example, at West FCC (JME084), DDX values declined from 51.14 mg/kg in 2007 to 0.7589 mg/kg in 2018. Present levels are now dramatically lower.

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4.0 Recommendations

Overall, most sites have exhibited a reduction in contamination levels over the duration of the study. DDX remains widespread and represents the dominant contaminant in sediment and shellfish.

Areas of concern remain at the West FCC stream and DDX contaminant levels at deep sediment sites. It is therefore recommended that annual monitoring of contaminants from all sites be continued.

Based on the variability of sediment and shellfish contaminants, and the elevated contamination in some estuarine and stream sediments, it is recommended that biota sampling also be continued.

References

- Davidson, R. J.; Richards, L.A.; Easton, J. 2010. Post-remediation monitoring of sediments and biota from estuarine sites located adjacent to the former Fruitgrowers Chemical Company (FCC) site, Mapua, Nelson. Prepared by Davidson Environmental Limited for Tasman District Council and Ministry for the Environment. Survey and monitoring report no. 616.
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- Pattle Delamore Partners Ltd. 2009. Audit of the remediation of the former Fruitgrowers Chemical Company site, Mapua. A report prepared by Mike Clyde and Graeme Proffitt for the Ministry of the Environment. File W01738100 R01.
- Pattle Delamore Partners Ltd. 2011. Mapua FCC site remediation – Review of post-remediation monitoring (draft). A report prepared by Karen Sky and Graeme Proffitt for the Ministry of the Environment. File W01738103 R01.

Appendix 1. Sediment data 2019



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Certificate of Analysis Page 1 of 6

Client: Davidson Environmental Ltd	Lab No: 2138931	SPv1
Contact: R Davidson	Date Received: 09-Mar-2019	
C/- Davidson Environmental Ltd	Date Reported: 22-Mar-2019	
PO Box 958	Quote No: 91901	
Nelson 7040	Order No:	
	Client Reference: Mapua samples	
	Submitted By: R Davidson	

Sample Type: Sediment

Sample Name:	JME 080 West Control (Shallow) 07-Mar-2019 3:20 pm	JME 080 West Control (Deep) 07-Mar-2019 3:22 pm	JME 083 (Shallow) 07-Mar-2019 2:54 pm	JME 083 (Deep) 07-Mar-2019 2:55 pm	JME 081 (Shallow) 07-Mar-2019 2:57 pm	
Lab Number:	2138931.1	2138931.2	2138931.3	2138931.4	2138931.5	
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	0.0012	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	0.0014	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	< 0.0010	< 0.0010	0.036	0.107	0.0024
4,4'-DDD	mg/kg dry wt	< 0.0010	< 0.0010	0.091	0.28	0.0073
2,4'-DDE	mg/kg dry wt	< 0.0010	< 0.0010	0.0136	0.046	< 0.0010
4,4'-DDE	mg/kg dry wt	< 0.0010	< 0.0010	0.092	0.28	0.0082
2,4'-DDT	mg/kg dry wt	< 0.0010	< 0.0010	0.0035	0.0055	< 0.0010
4,4'-DDT	mg/kg dry wt	0.0015	< 0.0010	0.0147	0.028	0.0032
Total DDT Isomers	mg/kg dry wt	< 0.006	< 0.006	0.25	0.75	0.021
Dieldrin	mg/kg dry wt	< 0.0010	< 0.0010	0.0048	0.0098	< 0.0010
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	JME 081 (Deep) 07-Mar-2019 2:58 pm	JME 082 (Shallow) 07-Mar-2019 3:01 pm	JME 082 (Deep) 07-Mar-2019 3:02 pm	West FCC New 1 (West) (Shallow) 07-Mar-2019 2:40 pm	West FCC New 1 (West) (Deep) 07-Mar-2019 2:42 pm	
Lab Number:	2138931.6	2138931.7	2138931.8	2138931.9	2138931.10	
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	



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The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

Sample Type: Sediment						
Sample Name:	JME 081 (Deep) 07-Mar-2019 2:58 pm	JME 082 (Shallow) 07-Mar-2019 3:01 pm	JME 082 (Deep) 07-Mar-2019 3:02 pm	West FCC New 1 (West) (Shallow) 07-Mar-2019 2:40 pm	West FCC New 1 (West) (Deep) 07-Mar-2019 2:42 pm	
Lab Number:	2138931.6	2138931.7	2138931.8	2138931.9	2138931.10	
Organochlorine Pesticides Trace in Soil						
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.0053	0.0014	0.0032	0.0091	< 0.0010
4,4'-DDD	mg/kg dry wt	0.0152	0.0044	0.0081	0.0099	0.0013
2,4'-DDE	mg/kg dry wt	0.0023	< 0.0010	0.0019	0.0056	< 0.0010
4,4'-DDE	mg/kg dry wt	0.021	0.0060	0.021	0.061	0.0048
2,4'-DDT	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
4,4'-DDT	mg/kg dry wt	0.0077	0.0010	0.0017	0.0129	0.0013
Total DDT Isomers	mg/kg dry wt	0.052	0.013	0.035	0.098	0.007
Dieldrin	mg/kg dry wt	< 0.0010	0.0026	< 0.0010	< 0.0010	< 0.0010
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	West FCC New 2 (Middle) (Shallow) 07-Mar-2019 2:44 pm	West FCC New 2 (Middle) (Deep) 07-Mar-2019 2:46 pm	West FCC New 3 (East) (Shallow) 07-Mar-2019 2:49 pm	West FCC New 3 (East) (Deep) 07-Mar-2019 2:50 pm	JME 084 (Shallow) 07-Mar-2019 3:08 pm	
Lab Number:	2138931.11	2138931.12	2138931.13	2138931.14	2138931.15	
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.0085	0.0073	< 0.0010	< 0.0010	0.0014
4,4'-DDD	mg/kg dry wt	0.0138	0.0106	0.0018	0.0033	0.0040
2,4'-DDE	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
4,4'-DDE	mg/kg dry wt	0.024	0.0124	0.0036	0.0041	0.0080
2,4'-DDT	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
4,4'-DDT	mg/kg dry wt	0.0022	0.0116	< 0.0010	< 0.0010	0.0022
Total DDT Isomers	mg/kg dry wt	0.048	0.042	< 0.006	0.007	0.016
Dieldrin	mg/kg dry wt	< 0.0010	0.0011	< 0.0010	< 0.0010	< 0.0010
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Lab No: 2138931 v 1

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Sample Type: Sediment					
Sample Name:	West FCC New 2 (Middle) (Shallow) 07-Mar-2019 2:44 pm	West FCC New 2 (Middle) (Deep) 07-Mar-2019 2:46 pm	West FCC New 3 (East) (Shallow) 07-Mar-2019 2:49 pm	West FCC New 3 (East) (Deep) 07-Mar-2019 2:50 pm	JME 084 (Shallow) 07-Mar-2019 3:08 pm
Lab Number:	2138931.11	2138931.12	2138931.13	2138931.14	2138931.15
Organochlorine Pesticides Trace in Soil					
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	JME 084 (Deep) 07-Mar-2019 3:09 pm	West FCC Stream (Lower) (Shallow) 07-Mar-2019 2:24 pm	West FCC Stream (Lower) (Deep) 07-Mar-2019	West FCC Stream (Middle) (Shallow) 07-Mar-2019 2:19 pm	West FCC Stream (Middle) (Deep) 07-Mar-2019 2:22 pm
Lab Number:	2138931.16	2138931.17	2138931.18	2138931.19	2138931.20
Organochlorine Pesticides Trace in Soil					
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	0.0013	0.0014
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	0.0011
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.056	0.023	0.040	0.192
4,4'-DDD	mg/kg dry wt	0.062	0.055	0.096	0.47
2,4'-DDE	mg/kg dry wt	0.0059	0.0089	0.0173	0.091
4,4'-DDE	mg/kg dry wt	0.160	0.094	0.21	0.77
2,4'-DDT	mg/kg dry wt	0.0012	0.0015	0.0020	0.0129
4,4'-DDT	mg/kg dry wt	0.0031	0.0055	0.0090	0.051
Total DDT Isomers	mg/kg dry wt	0.29	0.188	0.37	1.59
Dieldrin	mg/kg dry wt	0.0105	0.0076	0.0154	0.085
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	West FCC Stream (Upper) (Shallow) 07-Mar-2019 2:15 pm	West FCC Stream (Upper) (Deep) 07-Mar-2019 2:16 pm	JME 088 (Shallow) 07-Mar-2019 4:36 pm	JME 088 (Deep) 07-Mar-2019 4:38 pm	JME 087 (Shallow) 07-Mar-2019 4:34 pm
Lab Number:	2138931.21	2138931.22	2138931.23	2138931.24	2138931.25
Organochlorine Pesticides Trace in Soil					
Aldrin	mg/kg dry wt	< 0.0010	0.0019	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.071	0.22	0.0049	0.0081
4,4'-DDD	mg/kg dry wt	0.170	0.59	0.0127	0.023
2,4'-DDE	mg/kg dry wt	0.027	0.076	< 0.0010	< 0.0010
4,4'-DDE	mg/kg dry wt	0.23	0.27	0.0100	0.0121
2,4'-DDT	mg/kg dry wt	0.0035	0.0025	0.0040	< 0.0010

Sample Type: Sediment						
Sample Name:	West FCC Stream (Upper) (Shallow) 07-Mar-2019 2:15 pm	West FCC Stream (Upper) (Deep) 07-Mar-2019 2:16 pm	JME 088 (Shallow) 07-Mar-2019 4:36 pm	JME 088 (Deep) 07-Mar-2019 4:38 pm	JME 087 (Shallow) 07-Mar-2019 4:34 pm	
Lab Number:	2138931.21	2138931.22	2138931.23	2138931.24	2138931.25	
Organochlorine Pesticides Trace in Soil						
4,4'-DDT	mg/kg dry wt	0.0104	0.0070	0.0125	0.0094	0.0082
Total DDT Isomers	mg/kg dry wt	0.52	1.18	0.044	0.053	0.022
Dieldrin	mg/kg dry wt	0.032	0.025	0.0019	0.0015	0.0031
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	JME 087 (Deep) 07-Mar-2019 4:35 pm	JME 086 (Shallow) 07-Mar-2019 4:29 pm	JME 086 (Deep) 07-Mar-2019 4:30 pm	East FCC New 1 (North) (Shallow) 07-Mar-2019 4:39 pm	East FCC New 1 (North) (Deep) 07-Mar-2019 4:40 pm	
Lab Number:	2138931.26	2138931.27	2138931.28	2138931.29	2138931.30	
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	0.0138	< 0.0010	< 0.0010	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.0070	< 0.0010	0.0020	0.0060	0.0176
4,4'-DDD	mg/kg dry wt	0.022	0.0017	0.0042	0.0135	0.104
2,4'-DDE	mg/kg dry wt	< 0.0010	< 0.0010	0.0011	< 0.0010	0.0019
4,4'-DDE	mg/kg dry wt	0.0090	0.0020	0.0055	0.0136	0.036
2,4'-DDT	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	0.0058	0.039
4,4'-DDT	mg/kg dry wt	0.0033	0.0024	0.0011	0.0193	0.097
Total DDT Isomers	mg/kg dry wt	0.041	0.006	0.014	0.058	0.30
Dieldrin	mg/kg dry wt	0.084	< 0.0010	< 0.0010	0.0010	0.0035
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	East FCC New 2 (South) (Shallow) 07-Mar-2019 4:23 pm	East FCC New 2 (South) (Deep) 07-Mar-2019 4:26 pm	JME 090 (Shallow) 07-Mar-2019 4:20 pm	JME 090 (Deep) 07-Mar-2019 4:22 pm	Hunter-Brown (Control) (Shallow) 07-Mar-2019 5:34 pm	
Lab Number:	2138931.31	2138931.32	2138931.33	2138931.34	2138931.35	

Lab No: 2138931 v 1

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Sample Type: Sediment						
Sample Name:	East FCC New 2 (South) (Shallow) 07-Mar-2019 4:23 pm	East FCC New 2 (South) (Deep) 07-Mar-2019 4:26 pm	JME 090 (Shallow) 07-Mar-2019 4:20 pm	JME 090 (Deep) 07-Mar-2019 4:22 pm	Hunter-Brown (Control) (Shallow) 07-Mar-2019 5:34 pm	
Lab Number:	2138931.31	2138931.32	2138931.33	2138931.34	2138931.35	
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	< 0.0010	0.0019	< 0.0010	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	0.0013	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.0027	0.21	0.0045	0.0154	< 0.0010
4,4'-DDD	mg/kg dry wt	0.0088	0.70	0.0133	0.051	< 0.0010
2,4'-DDE	mg/kg dry wt	< 0.0010	0.0139	< 0.0010	0.0011	< 0.0010
4,4'-DDE	mg/kg dry wt	0.0054	0.194	0.0096	0.023	< 0.0010
2,4'-DDT	mg/kg dry wt	0.0011	0.134	0.0041	0.021	< 0.0010
4,4'-DDT	mg/kg dry wt	0.0046	0.95	0.032	0.166	< 0.0010
Total DDT Isomers	mg/kg dry wt	0.023	2.2	0.064	0.28	< 0.006
Dieldrin	mg/kg dry wt	< 0.0010	0.029	0.0011	0.0027	< 0.0010
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	Hunter-Brown (Control) (Deep) 07-Mar-2019 5:32 pm					
Lab Number:	2138931.36					
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	< 0.0010	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.0010	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.0010	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.0010	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.0010	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.0010	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.0010	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.0010	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.0010	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.0010	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.0010	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.0010	-	-	-	-
Total DDT Isomers	mg/kg dry wt	< 0.006	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.0010	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.0010	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.0010	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.0010	-	-	-	-
Endrin	mg/kg dry wt	< 0.0010	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.0010	-	-	-	-

Sample Type: Sediment						
Sample Name:	Hunter-Brown (Control) (Deep) 07-Mar-2019 5:32 pm					
Lab Number:	2138931.36					
Organochlorine Pesticides Trace in Soil						
Endrin ketone	mg/kg dry wt	< 0.0010	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.0010	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.0010	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.0010	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.0010	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	-	-	-	-

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Sediment			
Test	Method Description	Default Detection Limit	Sample No
Soil Prep Dry for Organics, Trace*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-36
Organochlorine Pesticides Trace in Soil	Sonication extraction, SPE cleanup, GPC cleanup (if required), dual column GC-ECD analysis. Tested on dried sample	0.0010 - 0.006 mg/kg dry wt	1-36

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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Ara Heron BSc (Tech)
Client Services Manager - Environmental

Appendix 2. Invertebrate data 2019



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Certificate of Analysis

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Client:	Davidson Environmental Ltd	Lab No:	2138930	SPv1
Contact:	R Davidson C/- Davidson Environmental Ltd PO Box 958 Nelson 7040	Date Received:	09-Mar-2019	
		Date Reported:	25-Mar-2019	
		Quote No:	91901	
		Order No:		
		Client Reference:	Mapua FCC	
		Submitted By:	R Davidson	

Sample Type: Shellfish						
Sample Name:	West Control JME 080 07-Mar-2019	JME 084 07-Mar-2019	East FCC Diloma Soft 07-Mar-2019	East FCC Amphibola 07-Mar-2019	East FCC Cockle 07-Mar-2019	
Lab Number:	2138930.1	2138930.2	2138930.3	2138930.4	2138930.5	
Individual Tests						
Dry Matter	g/100g as rcvd	14.0	13.8	-	12.0	10.3
Organochlorine Pesticides in Biomatter						
Aldrin	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
alpha-BHC	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
beta-BHC	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
delta-BHC	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
gamma-BHC (Lindane)	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
cis-Chlordane	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
trans-Chlordane	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4'-DDD	mg/kg	0.0006	0.064	0.0007	0.025	< 0.0005
4,4'-DDD	mg/kg	0.0027	0.113	0.0053	0.082	< 0.0005
2,4'-DDE	mg/kg	< 0.0005	0.0066	< 0.0005	0.0008	< 0.0005
4,4'-DDE	mg/kg	0.0139	0.93	0.0052	0.130	< 0.0005
2,4'-DDT	mg/kg	< 0.0005	0.0006	< 0.0005	0.0013	< 0.0005
4,4'-DDT	mg/kg	0.0019	0.023	0.0020	0.023	< 0.0005
Dieldrin	mg/kg	< 0.0005	0.029	0.0015	0.068	< 0.0005
Endosulfan I	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endosulfan II	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endosulfan sulfate	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endrin	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endrin aldehyde	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endrin ketone	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Heptachlor	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Heptachlor epoxide	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobenzene	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Methoxychlor	mg/kg	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Total Chlordane [(cis+trans)*100/42]	mg/kg	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	Hunter-Brown Control 07-Mar-2019					
Lab Number:	2138930.6					
Individual Tests						
Dry Matter	g/100g as rcvd	9.2	-	-	-	-

Sample Type: Shellfish						
Sample Name:	Hunter-Brown Control 07-Mar-2019					
Lab Number:	2138930.6					
Organochlorine Pesticides in Biomatter						
Aldrin	mg/kg	< 0.0005	-	-	-	-
alpha-BHC	mg/kg	< 0.0005	-	-	-	-
beta-BHC	mg/kg	< 0.0005	-	-	-	-
delta-BHC	mg/kg	< 0.0005	-	-	-	-
gamma-BHC (Lindane)	mg/kg	< 0.0005	-	-	-	-
cis-Chlordane	mg/kg	< 0.0005	-	-	-	-
trans-Chlordane	mg/kg	< 0.0005	-	-	-	-
2,4'-DDD	mg/kg	< 0.0005	-	-	-	-
4,4'-DDD	mg/kg	< 0.0005	-	-	-	-
2,4'-DDE	mg/kg	< 0.0005	-	-	-	-
4,4'-DDE	mg/kg	< 0.0005	-	-	-	-
2,4'-DDT	mg/kg	< 0.0005	-	-	-	-
4,4'-DDT	mg/kg	< 0.0005	-	-	-	-
Dieldrin	mg/kg	< 0.0005	-	-	-	-
Endosulfan I	mg/kg	< 0.0005	-	-	-	-
Endosulfan II	mg/kg	< 0.0005	-	-	-	-
Endosulfan sulfate	mg/kg	< 0.0005	-	-	-	-
Endrin	mg/kg	< 0.0005	-	-	-	-
Endrin aldehyde	mg/kg	< 0.0005	-	-	-	-
Endrin ketone	mg/kg	< 0.0005	-	-	-	-
Heptachlor	mg/kg	< 0.0005	-	-	-	-
Heptachlor epoxide	mg/kg	< 0.0005	-	-	-	-
Hexachlorobenzene	mg/kg	< 0.0005	-	-	-	-
Methoxychlor	mg/kg	< 0.0005	-	-	-	-
Total Chlordane [(cis+trans)*100/42]	mg/kg	< 0.002	-	-	-	-

Analyst's Comments

It should be noted that there was insufficient sample for 2138930.3 (East FCC Diloma Soft) to complete the dry matter analysis.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Shellfish			
Test	Method Description	Default Detection Limit	Sample No
Homogenisation of Biological samples for Organics Tests	Mincing, chopping, or blending of sample to form homogenous sample fraction.	-	1-6
Shucking of Shellfish	Removal of tissue from shell.	-	1-6
Homogenise	Mincing, chopping, or blending of sample to form homogenous sample fraction.	-	1-6
Dry Matter	Drying for minimum of 24 hours at 65°C, gravimetry. Fact Sheet No 2.3.2-14, A Compendium of Chemical, Physical and Biological Methods for Assessing and Monitoring the Remediation of Contaminated Sediment Sites, 2003.	0.10 g/100g as rcvd	1-2, 4-6
Organochlorine Pesticides in Biomatter	Sonication extraction, alumina cleanup, GPC cleanup, dual column GC-ECD analysis	0.0005 - 0.002 mg/kg	1-6

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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A handwritten signature in blue ink, appearing to read 'Graham Corban', is positioned above the printed name.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

Appendix 3. Sediment data 2018



Hill Laboratories
TRIED, TESTED AND TRUSTED

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Certificate of Analysis Page 1 of 6

Client: Davidson Environmental Ltd	Lab No: 1991748	SPv1
Contact: R Davidson	Date Received: 30-May-2018	
C/- Davidson Environmental Ltd	Date Reported: 25-Jun-2018	
PO Box 958	Quote No: 91901	
Nelson 7040	Order No:	
	Client Reference: Mapua	
	Submitted By: R Davidson	

Sample Type: Sediment					
Sample Name:	West Control JME 080 Shallow 28-May-2018 11:57 am	West Control JME 080 Deep 28-May-2018 11:57 am	JME 083 Shallow 28-May-2018 12:29 am	JME 083 Deep 28-May-2018 12:29 am	JME 081 Shallow 28-May-2018 12:25 am
Lab Number:	1991748.1	1991748.2	1991748.3	1991748.4	1991748.5
Organochlorine Pesticides Trace in Soil					
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	< 0.0010	< 0.0010	0.0047	0.044
4,4'-DDD	mg/kg dry wt	< 0.0010	< 0.0010	0.0073	0.032
2,4'-DDE	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	0.0081
4,4'-DDE	mg/kg dry wt	< 0.0010	0.0020	0.021	0.153
2,4'-DDT	mg/kg dry wt	< 0.0010	< 0.0010	0.0012	0.021
4,4'-DDT	mg/kg dry wt	< 0.0010	< 0.0010	0.0168	0.182
Total DDT Isomers	mg/kg dry wt	< 0.006	< 0.006	0.051	0.44
Dieldrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	0.0144
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	0.002
Sample Name:	JME 081 Deep 28-May-2018 12:26 am	JME 082 Shallow 28-May-2018 12:17 am	JME 082 Deep 28-May-2018 12:18 am	West FCC New 1 Shallow 28-May-2018 12:48 am	West FCC New 1 Deep 28-May-2018 12:49 am
Lab Number:	1991748.6	1991748.7	1991748.8	1991748.9	1991748.10
Organochlorine Pesticides Trace in Soil					
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010



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Sample Type: Sediment						
Sample Name:	JME 081 Deep 28-May-2018 12:26 am	JME 082 Shallow 28-May-2018 12:17 am	JME 082 Deep 28-May-2018 12:18 am	West FCC New 1 Shallow 28-May-2018 12:48 am	West FCC New 1 Deep 28-May-2018 12:49 am	
Lab Number:	1991748.6	1991748.7	1991748.8	1991748.9	1991748.10	
Organochlorine Pesticides Trace in Soil						
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.0143	< 0.0010	< 0.0010	0.0069	0.0106
4,4'-DDD	mg/kg dry wt	0.030	0.0037	0.0011	0.0137	0.029
2,4'-DDE	mg/kg dry wt	0.0057	< 0.0010	< 0.0010	0.0067	0.0049
4,4'-DDE	mg/kg dry wt	0.049	0.0060	0.0063	0.047	0.048
2,4'-DDT	mg/kg dry wt	0.0036	< 0.0010	< 0.0010	0.0033	< 0.0010
4,4'-DDT	mg/kg dry wt	0.020	0.0027	0.0021	0.0107	0.0055
Total DDT Isomers	mg/kg dry wt	0.122	0.012	0.010	0.088	0.097
Dieldrin	mg/kg dry wt	0.0039	< 0.0010	< 0.0010	0.0028	0.0019
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Sample Name:	West FCC New 2 Shallow 28-May-2018 12:52 am	West FCC New 2 Deep 28-May-2018 12:54 am	West FCC New 3 Shallow 28-May-2018 12:57 am	West FCC New 3 Deep 28-May-2018 12:58 am	JME 084 Shallow 28-May-2018 12:36 am	
Lab Number:	1991748.11	1991748.12	1991748.13	1991748.14	1991748.15	
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.0088	0.0147	0.0013	< 0.0010	0.0027
4,4'-DDD	mg/kg dry wt	0.021	0.032	0.0028	0.0024	0.0069
2,4'-DDE	mg/kg dry wt	0.0020	0.0022	< 0.0010	< 0.0010	< 0.0010
4,4'-DDE	mg/kg dry wt	0.037	0.054	0.0069	0.0062	0.0115
2,4'-DDT	mg/kg dry wt	0.0027	< 0.0010	< 0.0010	< 0.0010	< 0.0010
4,4'-DDT	mg/kg dry wt	0.0101	0.0062	0.0015	< 0.0010	0.0018
Total DDT Isomers	mg/kg dry wt	0.082	0.110	0.012	0.009	0.023
Dieldrin	mg/kg dry wt	0.0012	0.0014	< 0.0010	< 0.0010	< 0.0010
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Lab No: 1991748 v 1

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Sample Type: Sediment					
Sample Name:	West FCC New 2 Shallow 28-May-2018 12:52 am	West FCC New 2 Deep 28-May-2018 12:54 am	West FCC New 3 Shallow 28-May-2018 12:57 am	West FCC New 3 Deep 28-May-2018 12:58 am	JME 084 Shallow 28-May-2018 12:36 am
Lab Number:	1991748.11	1991748.12	1991748.13	1991748.14	1991748.15
Organochlorine Pesticides Trace in Soil					
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	JME 084 Deep 28-May-2018 12:37 am	West FCC Stream 1 Shallow 28-May-2018 1:04 pm	West FCC Stream 1 Deep 28-May-2018 1:05 pm	West FCC Stream 2 Shallow 28-May-2018 1:09 pm	West FCC Stream 2 Deep 28-May-2018 1:10 pm
Lab Number:	1991748.16	1991748.17	1991748.18	1991748.19	1991748.20
Organochlorine Pesticides Trace in Soil					
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	0.0013	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	0.0015	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.041	0.029	0.034	0.099
4,4'-DDD	mg/kg dry wt	0.056	0.077	0.089	0.26
2,4'-DDE	mg/kg dry wt	0.0080	0.0103	0.0127	0.042
4,4'-DDE	mg/kg dry wt	0.154	0.133	0.175	0.45
2,4'-DDT	mg/kg dry wt	0.0012	0.0028	0.0032	0.0114
4,4'-DDT	mg/kg dry wt	0.0032	0.0099	0.0128	0.044
Total DDT Isomers	mg/kg dry wt	0.26	0.26	0.33	0.91
Dieldrin	mg/kg dry wt	0.0101	0.0131	0.0121	0.061
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	0.006	< 0.002	< 0.002	< 0.002
Sample Name:	West FCC Stream 3 (upper) Shallow 28-May-2018 1:14 pm	West FCC Stream 3 (upper) Deep 28-May-2018 1:15 pm	JME 088 Shallow 28-May-2018 2:44 pm	JME 088 Deep 28-May-2018 2:45 pm	JME 087 Shallow 28-May-2018 2:58 pm
Lab Number:	1991748.21	1991748.22	1991748.23	1991748.24	1991748.25
Organochlorine Pesticides Trace in Soil					
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	0.0011	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	0.0011	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.0170	0.099	0.0069	0.0168
4,4'-DDD	mg/kg dry wt	0.045	0.28	0.0135	0.041
2,4'-DDE	mg/kg dry wt	0.0047	0.031	< 0.0010	< 0.0010
4,4'-DDE	mg/kg dry wt	0.069	0.29	0.0074	0.028
2,4'-DDT	mg/kg dry wt	0.0030	0.0035	0.0121	0.0016
4,4'-DDT	mg/kg dry wt	0.0089	0.0140	0.032	0.050

Lab No: 1991748 v 1

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Sample Type: Sediment						
Sample Name:	West FCC Stream 3 (upper) Shallow 28-May-2018 1:14 pm	West FCC Stream 3 (upper) Deep 28-May-2018 1:15 pm	JME 088 Shallow 28-May-2018 2:44 pm	JME 088 Deep 28-May-2018 2:45 pm	JME 087 Shallow 28-May-2018 2:58 pm	
Lab Number:	1991748.21	1991748.22	1991748.23	1991748.24	1991748.25	
Organochlorine Pesticides Trace in Soil						
Total DDT Isomers	mg/kg dry wt	0.147	0.72	0.072	0.137	0.027
Dieldrin	mg/kg dry wt	0.0167	0.069	0.0083	0.0029	< 0.0010
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	0.005	< 0.002	< 0.002	< 0.002
Sample Name:	JME 087 Deep 28-May-2018 2:50 pm	JME 086 Shallow 28-May-2018 2:52 pm	JME 086 Deep 28-May-2018 2:53 pm	East FCC New 1 Shallow 28-May-2018 2:57 pm	East FCC New 1 Deep 28-May-2018 2:56 pm	
Lab Number:	1991748.26	1991748.27	1991748.28	1991748.29	1991748.30	
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	< 0.0010	< 0.0010	0.0013	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.0037	0.0011	0.0051	0.0083	0.021
4,4'-DDD	mg/kg dry wt	0.0086	0.0065	0.0117	0.0198	0.052
2,4'-DDE	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0021
4,4'-DDE	mg/kg dry wt	0.0059	0.0016	0.0052	0.0162	0.051
2,4'-DDT	mg/kg dry wt	0.0049	0.0014	< 0.0010	0.0131	0.0197
4,4'-DDT	mg/kg dry wt	0.025	0.0134	0.0026	0.055	0.100
Total DDT Isomers	mg/kg dry wt	0.049	0.024	0.025	0.112	0.25
Dieldrin	mg/kg dry wt	< 0.0010	< 0.0010	0.0027	0.0014	0.0029
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	East FCC New 2 Shallow 28-May-2018 2:39 pm	East FCC New 2 Deep 28-May-2018 2:40 pm	Hunter-Brown Shallow 28-May-2018 4:05 pm	Hunter-Brown Deep 28-May-2018 4:07 pm	JME 090 Shallow 28-May-2018 2:35 am	
Lab Number:	1991748.31	1991748.32	1991748.33	1991748.34	1991748.35	

Sample Type: Sediment						
Sample Name:	East FCC New 2 Shallow 28-May-2018 2:39 pm	East FCC New 2 Deep 28-May-2018 2:40 pm	Hunter-Brown Shallow 28-May-2018 4:05 pm	Hunter-Brown Deep 28-May-2018 4:07 pm	JME 090 Shallow 28-May-2018 2:35 am	
Lab Number:	1991748.31	1991748.32	1991748.33	1991748.34	1991748.35	
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	< 0.0010	0.0014	< 0.0010	< 0.0010	< 0.0010
alpha-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
beta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
delta-BHC	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
cis-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
trans-Chlordane	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4'-DDD	mg/kg dry wt	0.0028	0.148	< 0.0010	< 0.0010	0.0189
4,4'-DDD	mg/kg dry wt	0.0074	0.38	< 0.0010	< 0.0010	0.047
2,4'-DDE	mg/kg dry wt	< 0.0010	0.0133	< 0.0010	< 0.0010	< 0.0010
4,4'-DDE	mg/kg dry wt	0.0076	0.23	< 0.0010	< 0.0010	0.0114
2,4'-DDT	mg/kg dry wt	0.0054	0.037	< 0.0010	< 0.0010	0.020
4,4'-DDT	mg/kg dry wt	0.0192	0.29	< 0.0010	< 0.0010	0.071
Total DDT Isomers	mg/kg dry wt	0.042	1.10	< 0.006	< 0.006	0.168
Dieldrin	mg/kg dry wt	< 0.0010	0.043	< 0.0010	< 0.0010	0.0016
Endosulfan I	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulphate	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin aldehyde	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin ketone	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor epoxide	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Hexachlorobenzene	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Methoxychlor	mg/kg dry wt	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	JME 090 Deep 28-May-2018 2:36 pm					
Lab Number:	1991748.36					
Organochlorine Pesticides Trace in Soil						
Aldrin	mg/kg dry wt	< 0.0010	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.0010	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.0010	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.0010	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.0010	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.0010	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.0010	-	-	-	-
2,4'-DDD	mg/kg dry wt	0.033	-	-	-	-
4,4'-DDD	mg/kg dry wt	0.089	-	-	-	-
2,4'-DDE	mg/kg dry wt	0.0017	-	-	-	-
4,4'-DDE	mg/kg dry wt	0.028	-	-	-	-
2,4'-DDT	mg/kg dry wt	0.0038	-	-	-	-
4,4'-DDT	mg/kg dry wt	0.035	-	-	-	-
Total DDT Isomers	mg/kg dry wt	0.191	-	-	-	-
Dieldrin	mg/kg dry wt	0.0019	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.0010	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.0010	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.0010	-	-	-	-
Endrin	mg/kg dry wt	< 0.0010	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.0010	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.0010	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.0010	-	-	-	-

Lab No: 1991748 v 1

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Sample Type: Sediment						
Sample Name:		JME 090 Deep 28-May-2018 2:36 pm				
Lab Number:		1991748.36				
Organochlorine Pesticides Trace in Soil						
Heptachlor epoxide	mg/kg dry wt	< 0.0010	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.0010	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.0010	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.002	-	-	-	-

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Sediment			
Test	Method Description	Default Detection Limit	Sample No
Organochlorine Pesticides Trace in Soil	Sonication extraction, SPE cleanup, GPC cleanup (if required), dual column GC-ECD analysis. Tested on dried sample	0.0010 - 0.006 mg/kg dry wt	1-36

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

Appendix 4. Invertebrate data 2018



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Client: Davidson Environmental Ltd	Lab No: 1991753	SPv1
Contact: R Davidson	Date Received: 30-May-2018	
C/- Davidson Environmental Ltd	Date Reported: 06-Jul-2018	
PO Box 958	Quote No: 91901	
Nelson 7040	Order No:	
	Client Reference:	
	Submitted By: R Davidson	

Sample Type: Shellfish						
Sample Name:	West Control JME 080 (Amplibola) 28-May-2018	West FCC JME 084 (Amplibola) 28-May-2018	East FCC (Amplibola) 28-May-2018	East FCC NEW 2 (Diloma) 28-May-2018	EAST FCC JME 090 (Cockle) 28-May-2018	
Lab Number:	1991753.1	1991753.2	1991753.3	1991753.4	1991753.5	
Individual Tests						
Dry Matter	g/100g as rcvd	13.9	12.7	11.1	16.6	10.0
Organochlorine Pesticides in Biomatter						
Aldrin	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
alpha-BHC	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
beta-BHC	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
delta-BHC	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
gamma-BHC (Lindane)	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
cis-Chlordane	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
trans-Chlordane	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
2,4'-DDD	mg/kg	< 0.0007	0.027	0.0168	0.0012	< 0.0005
4,4'-DDD	mg/kg	0.0014	0.076	0.060	0.0040	< 0.0005
2,4'-DDE	mg/kg	< 0.0007	0.0019	0.0011	< 0.0008	< 0.0005
4,4'-DDE	mg/kg	0.0116	0.64	0.106	0.0076	0.0007
2,4'-DDT	mg/kg	< 0.0007	< 0.0005	0.0031	< 0.0008	< 0.0005
4,4'-DDT	mg/kg	0.0030	0.0135	0.040	0.0041	< 0.0005
Dieldrin	mg/kg	< 0.0007	0.0157	0.049	0.0036	0.0007
Endosulfan I	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Endosulfan II	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Endosulfan sulfate	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Endrin	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Endrin aldehyde	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Endrin ketone	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Heptachlor	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Heptachlor epoxide	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Hexachlorobenzene	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Methoxychlor	mg/kg	< 0.0007	< 0.0005	< 0.0005	< 0.0008	< 0.0005
Total Chlordane [(cis+trans)*100/42]	mg/kg	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Sample Name:	East Control Hunter Brown (Cockle) 28-May-2018					
Lab Number:	1991753.6					
Individual Tests						
Dry Matter	g/100g as rcvd	10.5	-	-	-	-

Sample Type: Shellfish						
Sample Name:		East Control Hunter Brown (Cockle) 28-May-2018				
Lab Number:		1991753.6				
Organochlorine Pesticides in Biomatter						
Aldrin	mg/kg	< 0.0005	-	-	-	-
alpha-BHC	mg/kg	< 0.0005	-	-	-	-
beta-BHC	mg/kg	< 0.0005	-	-	-	-
delta-BHC	mg/kg	< 0.0005	-	-	-	-
gamma-BHC (Lindane)	mg/kg	< 0.0005	-	-	-	-
cis-Chlordane	mg/kg	< 0.0005	-	-	-	-
trans-Chlordane	mg/kg	< 0.0005	-	-	-	-
2,4'-DDD	mg/kg	< 0.0005	-	-	-	-
4,4'-DDD	mg/kg	< 0.0005	-	-	-	-
2,4'-DDE	mg/kg	< 0.0005	-	-	-	-
4,4'-DDE	mg/kg	< 0.0005	-	-	-	-
2,4'-DDT	mg/kg	< 0.0005	-	-	-	-
4,4'-DDT	mg/kg	< 0.0005	-	-	-	-
Dieldrin	mg/kg	< 0.0005	-	-	-	-
Endosulfan I	mg/kg	< 0.0005	-	-	-	-
Endosulfan II	mg/kg	< 0.0005	-	-	-	-
Endosulfan sulfate	mg/kg	< 0.0005	-	-	-	-
Endrin	mg/kg	< 0.0005	-	-	-	-
Endrin aldehyde	mg/kg	< 0.0005	-	-	-	-
Endrin ketone	mg/kg	< 0.0005	-	-	-	-
Heptachlor	mg/kg	< 0.0005	-	-	-	-
Heptachlor epoxide	mg/kg	< 0.0005	-	-	-	-
Hexachlorobenzene	mg/kg	< 0.0005	-	-	-	-
Methoxychlor	mg/kg	< 0.0005	-	-	-	-
Total Chlordane [(cis+trans)*100/42]	mg/kg	< 0.002	-	-	-	-

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Shellfish			
Test	Method Description	Default Detection Limit	Sample No
Shucking of Shellfish	Removal of tissue from shell.	-	1-6
Homogenise	Mincing, chopping, or blending of sample to form homogenous sample fraction.	-	1-6
Dry Matter	Drying for minimum of 24 hours at 65°C, gravimetry. Fact Sheet No 2.3.2-14, A Compendium of Chemical, Physical and Biological Methods for Assessing and Monitoring the Remediation of Contaminated Sediment Sites, 2003.	0.10 g/100g as rcvd	1-6
Organochlorine Pesticides in Biomatter	Sonication extraction, alumina cleanup, GPC cleanup, dual column GC-ECD analysis	0.0005 - 0.002 mg/kg	1-6

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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