



Vista Gold Australia Pty Ltd
Mt Todd Discharge
Treated Retention Pond 3 Ecotoxicological Report

July 2013

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1. Introduction

1.1 Project Background

Vista Gold Australia Pty Ltd (Vista Gold) received a Waste Discharge Licence (WDL 178-2) on 5 February 2013 from the Northern Territory Environment Protection Authority (NT EPA). The WDL outlines environmental requirements for protection of the Edith River from mine wastewater discharges. Previously, Vista Gold derived interim site specific trigger values (ISSTVs) (GHD 2012) to meet the 95% species protection trigger values downstream of the site at SW10 (8.7 km from SW4) to meet the requirements of WDL 178-1. However, the use of dilution factors derived from direct toxicity assessment (DTA) for three water bodies at the Mt Todd mine site have been selected as the most appropriate method for deriving safe concentrations of metals for environmental protection of the Edith River to meet the requirements of WDL 178-2.

The DTA method is recommended by ANZECC & ARMICANZ (2000) where chemicals are present in a complex mixture. DTA allows the determination of direct biological effects on appropriate species to be assessed and also enables metal concentrations to be established that would not cause adverse environmental effects.

DTA has been used throughout Australia to establish appropriate dilution factors for complex effluents. For example the Perth Desalination Plant (Geotechnical Services 2006, 2008) provided dilution factors to be met at the 80% species protection level within the Low Protection Area at the outfall, and the 90% species protection level at Moderate Protection Area in Cockburn Sound. All other desalination plants around Australia have used the DTA methodology to derive appropriate dilution factors and engineer the outfall configuration to meet the required dilutions (BHP Billiton 2009, Victorian Government 2008).

This report should be read in conjunction with the Waste Discharge Plan (GHD 2013) (<http://mttodd.com.au/content/waste-discharge-licence>).

1.2 Objective

WDL 178-2 requires that ecotoxicological assessment be conducted for a wastewater source. This treated retention pond (RP) 3 Ecotox DTA Report has been developed to address the relevant sections of the WDL 178-2 to derive a dilution factor for RP3 prior to discharging treated mine water into the Edith River.

1.3 Scope of Work

This Report addresses the following aspects of the WDL 178-2:

- The methodology for calculating the 80% species protection ANZECC & ARMICANZ (2000) dilution factor for ecosystem protection applied at SW4 for mine discharges from RP3.
- Deriving Monitoring Values for the treated RP3 mine water to be met at SW4 to check that the dilution factor for the treated mine water is being met.

1.4 Limitations

This Vista Gold Australia Retention Pond 3 Ecotoxicological Report (“Report”):

- 1. has been prepared by GHD Pty Ltd (“GHD”) for Vista Gold Australia Pty Ltd (Vista Gold) and the NT EPA;*
- 2. may only be used and relied on by Vista Gold and the NT EPA;*
- 3. must not be copied to, used by, or relied on by any person other than Vista Gold without the prior written consent of Vista Gold;*
- 4. may only be used for the purpose of addressing WDL 178-2 requirements (and must not be used for any other purpose).*

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than Vista Gold arising from or in connection with this Report.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in section 1.3 of this Report.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report (“Assumptions”), including (but not limited to) those specified in section 1.5 below.

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation and may be relied on until 6 months, after which time, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

1.5 Assumptions

The assumptions upon which this report is based are:

- The treated mine water tested for DTA was representative of the RP3 water at the time of testing; and
- SW2 water used in the DTA was representative of late wet season Edith River water.

2. Direct Toxicity Assessment Methodology

2.1 Direct Toxicity Assessment

Direct Toxicity Assessment (DTA) provides an integrated measure of the toxicity of chemicals within a complex mixture, and accounts for interactions between compounds which may be additive, synergistic or ameliorative. DTA provides a better representation of natural environmental conditions than single chemical testing, and is therefore recommended by ANZECC & ARMCANZ (2000) for assessing the environmental impact from complex effluents.

The Mt Todd DTA program was designed in line with the recommendations contained in ANZECC & ARMCANZ (2000). ANZECC & ARMCANZ (2000) states that a DTA program should address the following design considerations:

- Test species selection
- Receiving water selection
- Nature of contaminant(s)
- Test methods
- Statistical considerations.

2.1.1 Selected Species

ANZECC & ARMCANZ (2000) "Minimum requirements for DTA" (section 8.3.6.8) recommend that toxicity data from between three and five species representing at least four different taxonomic groups (where five species are used) is required for effluent DTA. Further information on species used in the DTAs conducted for Mt Todd discharge to the Edith River is shown in Table 1 below.

Often, due to laboratory issues, not all tests listed in Table 1 are available at the time of testing. DTAs conducted on RP1, RP7 and RP3 Pilot Trial used a maximum of seven species to provide confidence in the species sensitivity distribution calculation.

Tests were selected adhering to the following criteria:

- a minimum of five bioassays covering at least four taxa
- preferably chronic endpoints to avoid the used of application factors
- locally occurring species or species representative of the ecosystem
- dilution water sampled from SW2 (upstream site)
- sufficient test dilutions to obtain a statistically valid EC10 (i.e. tight 95% confidence limits)
- bioassay suite sensitive to a broad range of contaminants.

The bioassays were conducted in two laboratories because not all bioassays are available from one laboratory. The cladoceran (*Moinodaphnia macleayi*) is the most sensitive bioassay species and is only able to be conducted by the ERISS Laboratory in Darwin. All other bioassays are conducted by Ecotox Services Australasia located in Sydney as shown in Table 1. The fish larval development was not used in this suite of bioassays due to unavailability of suitable numbers and quality of fish eggs.

Table 1 Species used in the Ecotoxicological Assessment of Treated RP3 Discharge

Test Organism	Test Duration	Test Endpoint	Key Reference	Laboratory
<i>Chlorella vulgaris</i> (green alga)	72 hour (chronic)	Growth inhibition	USEPA Method 1003.0 (2002)	Ecotox Services
<i>Lemna aequinoctialis</i> (duckweed)	96 hour (chronic)	Growth (frond number)	OECD Method 221 (2006)	Ecotox Services
<i>Moinodaphnia macleayi</i> (water flea)	3 brood (chronic)	Reproduction	Riethmuller <i>et al.</i> (2003)	ERISS
<i>Hydra viridissima</i> Pallas (green hydra)	96 hour (chronic)	Population growth	Riethmuller <i>et al.</i> (2003)	Ecotox Services
<i>Chironomus tepperi</i> (chironomid)	48 hour (acute)	Survival	USEPA (2002), OECD (2011)	Ecotox Services
<i>Macrobrachium bullatum</i> (shrimp)	96 hour (acute)	Survival	ESA SOP 123 (ESA 2012)	Ecotox Services

2.1.2 Concentrations Tested

Edith River water sampled from the upstream site SW2 was used as the diluent to assess the toxicity of the treated RP3 mine water. A laboratory control was run concurrently with all tests to confirm that the natural diluent water was not confounding the bioassays (as can happen in many cases). All samples were serially diluted with the SW2 river water to achieve the required test concentrations. Concentrations differed between bioassays due to methodologies used and sensitivity of the species tested as determined by previous bioassays, as shown in Table 2.

Table 2 Concentrations of Treated RP3 used in Bioassays

Microalga % RP3	Duckweed % RP3	Cladoceran % RP3	Hydra % RP3	Chironomid % RP3	Shrimp % RP3
0	0	0	0	0	0
6.3	3.1	0.03125	6.3	6.3	6.3
12.5	6.1	0.0625	12.5	12.5	12.5
25	12.1	0.125	25	25	25
50	24.2	0.25	50	50	50
100	48.4	0.5	100	100	100
-	96.8	1.0	-	-	-
-	-	2.0	-	-	-
-	-	4.0	-	-	-
-	-	8.0	-	-	-

2.1.3 Dilution Factors

Dilution factors are derived from results of DTA using bioassays representative of the receiving ecosystem which incorporates all actions of the constituents of the effluent. These results are placed in the BurrliOZ (Campbell *et al.* 2000) statistics program for calculation of a species sensitivity distribution and the concentration of effluent is determined to protect 80% of the populations in the receiving water from a 10% decrease in growth and / or reproduction.

Concentrations of individual chemicals cannot be extrapolated from DTAs for use as trigger values. However, individual chemical concentrations can be used for monitoring purposes to ensure that the dilution factors are met at the appropriate monitoring site. If the dilution factors are not met, the investigation procedure shown in Figure 1 of the Vista Gold Discharge Plan (GHD 2013) will be followed.

2.2 Surface Water Chemistry

Samples from SW2 (diluent) and treated RP3 water were analysed for the suite of analytes shown in Table 3.

Table 3 Analytes for SW2 and Treated RP3

	Analytes
In-Situ	DO, temperature, EC, pH
Metals (total and dissolved i.e. 0.45 µm)	Al, Cd, Co, Cu, Cr, Fe, Pb, Mg, Mn, Hg, Ni, Zn
Others	NO ₃ , PO ₄ , SO ₄ , bicarbonate, alkalinity, hardness, TDS, TSS, TS, Na, Cl, Ca, WAD cyanide, TOC and DOC

2.3 Sample Sites

RP3 and SW2 sampling locations are shown in Table 4. The treated RP3 water was sampled at 10 metres below the RP surface. This depth is the proposed pumping depth for discharge and provides treated water with the highest pH and lowest metal concentrations.

Table 4 Sampling Sites

Site Name	Site Description	Easting (UTM)	Northing	Latitude (degree, decimal)	Longitude
SW2	Edith River at bridge on Edith Falls Road	0189088	8431347	-14.1718	132.12
RP3	Batman Pit	0187055	8434993	-14.1388	132.1015

3. Results

3.1 Ecotoxicology Testing of RP3 Treated Water (in-situ)

The species used were appropriate for the site and the EC10 and LC50 results were of sufficient quality to be used in the BurrliOZ (Campbell *et al.*, 2000) program for species sensitivity distribution (SSD) calculations. Not all species that were used in the ERISS (2005) toxicity testing program were available at the time of testing.

A copy of the Ecotox Report by Ecotox Services, “*Toxicity Assessment of a Treated Water Sample, March 2013*” and the ERISS Test Report are located in Appendix A. A summary of the results is provided in Table 5.

The results of the site specific DTA testing performed by Ecotox Services used in this assessment do meet the laboratory NATA requirements for quality assurance/quality control (QA/QC) parameters. It must be noted however, that the majority of the reference toxicant results are in the lower 10% of the Cusum chart limits, indicating that the organisms used were more sensitive to the toxicants than is usual (Appendix A). This sensitivity means that the results presented here from this treated RP3 DTA are very conservative.

ERISS does not hold NATA accreditation, but does perform similar QA/QC on toxicity tests, as is required for NATA accreditation.

Table 5 Summary of Treated RP3 Ecotox Results

Test	EC/IC10 and LC10 (95% confidence limits) % Treated RP3	EC/IC50 and LC50 (95% confidence limits) % Treated RP3
Microalgal 72-hour growth inhibition	3.1*	>100
Duckweed 96-hour growth	24.2 *	75.4 **
Cladoceran 6-day reproduction	4.1 **	6.8 **
Hydra 96-hour growth	61.7 (51.6-66.7)	>100
Chironomid 48-hour survival	100	>100
Shrimp 96-hour survival	100	>100

*No observable effect concentration (NOEC)

**95% confidence limits not reliable,

The results show that the algae and cladoceran are the most sensitive species to the treated RP3 water. There was no acute toxicity observed from treated RP3 water.

The cladoceran is sensitive to the treated RP3 water, which may be a reflection of the toxicity of the treated RP3 water to their food source (i.e. the unicellular alga).

The chemistry results shown in Table 8 indicate that the toxicity observed in the algal and cladoceran bioassays could not be attributed to the presence of metals, as the majority of toxic metals were below detection limits and below the 95% species protection default trigger values.

3.2 Acute to Chronic Ratios (ACR)

Two of the bioassays used in this study were acute bioassays where survival was the end point. The chironomid and shrimp are acute bioassays and the LC50 results need to be adjusted so that they can be incorporated into the statistics to calculate the SSD. ANZECC & ARMCANZ (2000) recommend an acute to chronic factor of 10 to go from an acute LC50 to a chronic NOEC or EC10. This acute to chronic ratio (ACR) was applied to the chironomid and shrimp LC50 data to obtain a conservative chronic EC10.

3.3 Concentrations used to calculate the SSD

The acute bioassays required an ACR adjustment, applied to the LC50 values for the chironomid (LC50/10) and shrimp (LC50/10). The values used to calculate the SSD and dilution factors are shown in Table 6.

Table 6 Values used to Calculate SSD

Bioassay	EC10 % RP3
Microalgal 72-hour growth inhibition	3.1
Duckweed 96-hour growth inhibition	24.2
Cladoceran 6-day reproduction	4.1
Hydra 96-hour growth	61.7
Chironomid 48-hour survival	10
Shrimp 96-hour survival	10

3.4 Species Protection Values

The EC10 and LC50/10 values from Table 6 were input into the BurrI/OZ (Campbell *et al.*, 2000) statistics program for calculation of the 80% species protection value using the SSD. The calculated value and the dilution factor required to reach the concentration are provided in Table 7.

Table 7 Species Protection Values

Species Protection Level	Concentration of Treated RP3 (%)	Dilution Factor
80%	5.1	1:20

3.5 Dilution Factor

The 80% species protection was selected as appropriate to provide a level of protection for the Edith River from the discharge of treated RP3 water over the dewatering period as required by the WDL 178-2. A dilution factor of 1:20 for the RP3 treated water (as at time of testing, 21/03/13) discharged into the Edith River will provide 80% of the species with protection from a 10% decrease in reproduction or growth (Table 7). The concentrations of chemicals at this dilution are shown in Table 8.

3.6 80% Species Protection Monitoring Values

The chemistry of the RP3 treated water at the 1:20 dilution is shown in Table 8. The complete chemistry results are located in Appendix B.

The levels of the 80% species protection trigger values for copper and zinc have been selected as monitoring values to be met to ensure that the dilution of the treated RP3 water is at 1:20 to meet the requirements of WDL 178-2 as the concentrations of other metals and metalloids in

the discharge will be below the 95% species protection trigger values at SW4 (with the exception of magnesium) and also below the laboratory detection limits in most cases.

Magnesium is above the designated trigger value for environmental protection of the Edith River, however, the presence of calcium in the treated RP3 water will ameliorate any toxicity threat posed by the elevated magnesium concentrations, as van Dam *et al.* (2010) have shown that elevated calcium reduced the toxicity of magnesium to three tropical freshwater species.

The concentrations of copper at 2.5 µg/L and zinc at 31 µg/L (80% species protection default trigger values) will be met at SW4 to ensure environmental protection of the Edith River. If this monitoring value is not met then action is triggered as shown in Figure 1 of the Discharge Plan (GHD 2013).

Table 8 Dilution Rates of RP3 Treated Water (in-situ) to Meet 80 % SSD Dilution (1:20)

Analytes (metals 0.45 µm)	SW2 13/03/13	RP3 Treated Water 21/03/13	Conc. in RP3 treated water at 1:20 to be met at SW4	ANZECC 80% species protection TVs/ISSTV	ANZECC 95% species protection TVs/ISSTV
pH	7.5	8.8	-	6-8	6-8
DO (%)	97.4	98.0	-	85-120	85-120
Conductivity (µS/cm)	19	2710	-	20-250	20-250
Mg (mg/L)	0.8	94	4.7	-	2.5*
Ca (mg/L)	0.5	490	24.5	-	-
SO ₄ (mg/L)	<1	1,700	85	129	129
Al (µg/L)	29	<10	<10	150	149
Cd (µg/L)	<0.1	0.3	<0.1	0.8	0.2
Co (µg/L)	<1	2.0	<1	90	90
Cr (µg/L)	<1	2.0	<1	40	1.0
Cu (µg/L)	<1	<1.0	<1	2.5	1.4
Fe (µg/L)	270	<10	<10	300	300
Mn (µg/L)	<5	<5.0	<5	3,600	1,700
Ni (µg/L)	<1	13	<1	17	11
Pb (µg/L)	<1	<1.0	<1	9.4	3.4
Hg (µg/L)	<0.05	<0.05	<0.05	5.4	0.6
Zn (µg/L)	1	6.0	<1	31	8.0

*Note. Cells in green are below the ISSTVs and ANZECC & ARM CANZ (2000) default 95% trigger values and below the laboratory detection limits *van Dam et al (2010)*

Table 9 shows the Monitoring Values for each discharge point as of 21 March 2013.

Table 9 Monitoring Values for SW4 (March 2013)

Discharge	Chemical	Concentration (µg/L) 0.45 µm filtered
RP3 Treated Water	Cu	2.5
	Zn	31
RP1 Untreated Water	Cu	4.3
RP7 Untreated Water	Cu	4.2

RP3 treated water will be assessed for toxicity prior to the 2013/2014 wet season and a revised dilution factor and revised Monitoring Values will be calculated. RP1 and RP7 mine waters will also be assessed for toxicity prior to the 2013/2014 wet season and revised dilution factors and Monitoring Values will be calculated.

4. Conclusions and Recommendations

4.1 Conclusions

Ongoing treatment of water in RP3 has resulted in substantial improvements in water quality since treatment began in November 2012 (Table 10).

The results of this direct toxicity assessment on treated water from RP3 show that a conservative dilution factor of 1:20 will provide an 80% species protection level at the downstream monitoring point SW4 on the Edith River. That is, one unit of RP3 water is to be diluted with 20 units flowing down the Edith River to mitigate any adverse impact on organisms within the receiving ecosystem. All metal concentrations will be below the 95% species protection default trigger values at SW4 at this dilution.

Table 10 RP3 Chemistry (Top 15 metres)

Analyte Dissolved µg/L	20 Oct 12	23 Nov 12	20 Dec 12	17 Jan 13	14 Feb 13	21 Mar 13
Aluminium	57,000	31,000	1,700	270	<10	<10
Chromium	2	2	1	<1	<1	2
Copper	10,000	11,000	9,900	5,400	140	<1
Lead	210	190	160	86	<1	<1
Cadmium	140	140	140	130	45	0.3
Zinc	36,000	34,000	38,000	39,000	8,400	6

Treatment of RP3 is on-going and the water quality is constantly improving with elevated pH and reduced metal concentrations (Table 10). The dilution factor of 1: 20 calculated in this report will be applied until the results of the next DTA become available prior to discharging for the 2013/2014 wet season.

4.2 Recommendations

To meet the 80% species protection level required by WDL 178-2, based on ecotoxicological testing, it is recommended that a dilution factor of 1:20 be applied to the discharge of RP3 treated mine water, with the following Monitoring Values applied at SW4:

- Cu 2.5 µg/L
- Zn 31.0 µg/L

These monitoring values will apply until a further round of ecotoxicological testing is conducted to derive a new dilution factor and Monitoring Values prior to discharging in the 3013/2014 wet season.

5. References

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Appendices

Appendix A – Ecotox Reports



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Cladoceran Reproduction Test Report (1324D & 1333D)

Client: Vista Gold Pty Ltd.
Project: Ecotoxicological assessment of Mt Todd Gold Mine discharge waters
Test Performed: BTT-D, 3 brood reproduction test using *Moinodaphnia macleayi*

Samples Collected:	March 2013		
Samples Received:	14 th March 2013 (SW2)	Tests Initiated:	25 th March 2013 and 20 th April 2013
	22 nd March 2013 (Treated RP3 water)		
ERISS Sample ID.	Sample Name	Sample Description	
Reference water	Edith River (SW2)	Edith River upstream reference site	
Toxicant	Treated RP3 water (RP3)	Lime treated water from Retention Pond 3	

Comments: The test 1333D was a repeated test due to an unexpectedly low IC10 value. SW2 and treated RP3 waters were received and filtered on 14th March 2013. On the 22st March 2013, a new batch of Treated RP3 water arrived. This was filtered on 22nd March and used for both tests. All waters were stored at 4°C until use.

Sample Physico-Chemistry and Preparation:

Sample	Physico-chemistry			
	pH	EC ^a	DO ^b	DOC ^c
QA Magela Creek water control	5.8	10	98	3.3
Edith River – reference water	6.7 ^e	22 ^e	112.7 ^e	2.3
Mt Todd treated RP3 water	8.9	2670	93	-47.5 ^d

^a EC = Electrical Conductivity ($\mu\text{S cm}^{-1}$) unless other units provided; ^b DO = Dissolved Oxygen (% saturation); ^c DOC = Dissolved organic carbon (mg L^{-1}); ^d Inorganic carbon = 47.8mg/L due to added carbonates. ^e Values based on water quality measurements from the start of test 1324D

Test Method: Cladoceran neonates (<6 h old) were exposed to a Magela Creek water QA control, a reference/control water (Edith River, SW2) and up to 9 concentrations of Mt Todd Mine treated RP3 water, diluted with the reference water, for a period of 144 h. All waters were filtered (3 µm pore size) prior to testing.

The test was completed when >80% of control cladocera had released their third brood offspring. Observations of the appearance and number of neonates produced by each cladoceran were recorded at 24 h intervals, after which the cladocera were transferred to fresh test solution containing food. The detailed test protocol is presented in Riethmuller et al. (2003).

Linear interpolation analysis was used to determine point estimates of Inhibitory Concentrations (ICs) that reduced neonate production by 10% and 50% (i.e. IC₁₀ and IC₅₀) relative to the reference site control responses (CETIS v1.8.1.2).

Comments: A larger concentration range was achieved by reducing treatment replication from 10 to 5 per treatment. Control replication was not modified (i.e. 10 replicates). This allows greater characterisation of the concentration-response of the cladoceran.

Results ^a				
	Test 1 (1324D)		Test 2 (1333D)	
Treated RP3 water (%)	Mean neonate production ±	% of Reference	Mean neonate production ±	% of Reference
QA Magela Creek water control	26.9 ± 3.5	82	31.5 ± 3.1	121
SW2 - Reference water	33.0 ± 1.4	100	26.1 ± 4.2	100
0.03	33.8 ± 0.9	102	Not tested	
0.06	34.4 ± 0.7	104	13.2 ± 6.8	50
0.13	24.3 ± 5.7	74	30.6 ± 2.7	117
0.25	26.6 ± 4.3	81	35.8 ± 1.2	137
0.5	35.8 ± 0.9	108	20.2 ± 7.5	77
1.0	20.0 ± 5.5	61	25.4 ± 6.9	97
2.0	28.0 ± 7.0	85	26.6 ± 6.0	101
4.0	28.0 ± 5.0	85	24.6 ± 6.5	94
8.0	24.2 ± 2.9	73	9.6 ± 3.9	36
Toxicity Estimates				
Test Number	IC10 (95% Confidence)		IC50 (95% Confidence limits)	
Test 1 (1324D)	0.1 (0.07 – 1.28) % RP3		>8.0 (N/A) % RP3 water	
Test 2 (1333D)	4.1 (NC ^b – 4.7) % RP3		6.8 (1.7 - NC) % RP3 water	

^a See Attachment A for test raw data and statistical analysis report. ^b Not calculable.

Comments

Test 1 (1324D)

There were no observed effects to individuals exposed to 0.03% and 0.06% treated RP3 water. Individuals exposed to 0.13 and 0.25% treated RP3 produced 36 and 19% less neonates compared to the SW2 control, respectively. Individuals exposed to 0.5% treated RP3 waters produced slightly more neonates compared to the control. All individuals exposed to $\geq 1.0\%$ treated RP3 water produced less than the controls.

The variability in the results were due to delayed reproduction where exposed groups did not produce all of their 3rd brood before test termination (i.e. when $\geq 80\%$ control cladocera had released their third brood offspring). Despite the reduction in brood number, individuals exposed to 4.0% treated RP3 water appeared to be morphologically healthy. Individuals exposed to 8.0% treated RP3 water also appeared healthy in the early stages of the test, having produced reasonable of neonates in the first and second broods. However, during the final 48 h of testing, one individual died and all others were immobile and appeared to be effected by oedema and haemorrhaging. Reproductive delay was clearly evident in this treatment with only one individual producing a 3rd brood. All other individuals had empty brood pouches therefore were considered unlikely to produce a third brood even if given additional time to do so. This severe adverse response provides evidence that the delayed reproduction detected between the 0.13 and 4.0% treatments was a true effect.

Test 2 (1333D)

An repeat test was conducted but due to the extended age of the SW2 water, there was $>20\%$ mortality in the SW2 control water. There were also random deaths throughout the treatments, which resulted in the 0.06% treatments producing 50% less neonates compared to the SW2 control and the 0.13 and 0.25% treatments producing more neonates than the SW2 control. However, there was a clear reduction in the health and reproduction of the individuals exposed to 8% treated RP3 water.

Quality Control *	Criterion	Test 1 (1324D)			Test 2 (1333D)		
		NMC W	SW2	Criterion Met for SW2?	NMC W	SW2	Criterion Met for SW2?
Mean # neonates in	>30	26.9	33	No	31.5	26.1	Yes
Control survival	>80%	90%	90%	Yes	80%	70%	No
pH	<1 unit	<1	1.6	No	<1	1.5	No
DO (throughout test)	>70%	>70%	>70%	Yes	>70%	>70%	Yes
EC	<10% or < 3 $\mu\text{S cm}^{-1}$	<10%	<10%	Yes	<10%	<10%	Yes
Reference toxicant EC50 ($\mu\text{g L}^{-1}$ U)		± 2 SD of running mean ie. 82 \pm 145			171		Yes

Comments

1324D

The pH in SW2 control water changed by > 1 unit over a 24 h period for both tests. This may have been due to the physico-chemical nature of the water possibly contributing to algal growth. The green alga, *Chlorella* sp., is a standard food and may be the source of pH increase because it removes carbon dioxide from the water. The pH change of the NMCW control was within the acceptable criteria of <1 unit. In test 1324D, NMCW control produced less than the acceptability criterion of >30 neonates but the SW2 reference water reached the criterion for both survival and neonate number.

1333D

In test 1333D, SW2 control did not meet the acceptability criterion of >30 neonates or survival of >80% of the organisms. This was likely due to the age of the water, which may have affected water quality. There was also pH increase of 1.5 pH units in the SW2 control, which is over the acceptability criteria. but replicated the result in the first test. NMCW QC control for this test met the criterion.

* See Attachment B for detailed test QC physico-chemical data.

References:

Riethmuller N, Camilleri C, Franklin N, Hogan AC, King A, Koch A, Markich SJ, Turley C & van Dam R 2003. *Ecotoxicological testing protocols for Australian tropical freshwater ecosystems*. Supervising Scientist Report 173, Supervising Scientist, Darwin NT.
<http://www.environment.gov.au/ssd/publications/ssr/pubs/ssr173-print-quality.pdf>

Test carried out by:	Kim Cheng and Alicia Hogan
Test supervised by:	Rick van Dam and Andrew Harford
Test report prepared by:	Kim Cheng Professional Officer (ph: 08 8920 1361)
Test report authorised by:	Andrew Harford A/g Program Leader (ph: 08 8920 1175)
Date:	17/05/13

Attachment A1 – Test raw data and statistical analysis report (1324D)

CETIS Analytical Report

Report Date: 02 Apr-13 09:07 (p 1 of 2)
 Test Code: 1324D | 15-5743-7365

Cladoceran Reproduction Test			eriss ecotoxicology lab		
Analysis ID: 20-1744-2922	Endpoint: Total neonates	CETIS Version: CETISv1.8.7			
Analyzed: 02 Apr-13 9:05	Analysis: Linear Interpolation (ICPIN)	Official Results: Yes			
Batch ID: 09-5414-2342	Test Type: Cladoceran reproduction	Analyst: Kim Cheng			
Start Date: 25 Mar-13	Protocol: Clad (chronic) eriss tropical freshwater	Diluent: Upstream of Discharge			
Ending Date: 31 Mar-13	Species: Moinodaphnia macleayi	Brine: Not Applicable			
Duration: 6d 0h	Source: In-House Culture	Age:			
Sample ID: 09-2982-9698	Code: 1324D	Client: Vista Gold			
Sample Date: 02 Apr-13 08:53	Material: RP3	Project: Mt Todd			
Receive Date: 29 Mar-13	Source: RP3				
Sample Age: NA	Station:				

Linear Interpolation Options					
X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1365825	200	Yes	Two-Point Interpolation

Residual Analysis					
Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	3.586	3.159	0.0071	Outlier Detected

Point Estimates						
Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	0.08383	0.0587	0.7576	1193	132	1704
IC10	0.1056	0.07498	1.151	947	86.85	1334
IC15	0.5257	N/A	6.517	190.2	15.35	NA
IC20	0.7492	N/A	N/A	133.5	NA	NA
IC25	4.087	N/A	N/A	24.47	NA	NA
IC40	>8	N/A	N/A	<12.5	NA	NA
IC50	>8	N/A	N/A	<12.5	NA	NA

Total neonates Summary			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Upstream Contro	10	33	22	37	1.382	4.372	13.25%	0.0%
0.03125		5	33.8	32	37	0.8602	1.924	5.69%	-2.42%
0.0625		5	34.4	32	36	0.6782	1.517	4.41%	-4.24%
0.125		4	24.25	12	37	5.662	11.32	48.7%	26.52%
0.25		5	26.6	18	37	4.297	9.607	36.12%	19.39%
0.5		5	35.8	33	38	0.8602	1.924	5.37%	-8.49%
1		5	20	0	34	5.523	12.35	61.75%	39.39%
2		5	28	0	37	7.029	15.72	56.13%	15.15%
4		5	28	8	34	5.03	11.25	40.17%	15.15%
8		5	24.2	19	35	2.853	6.38	26.36%	26.67%

Total neonates Detail												
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10	
0	Upstream Control	31	35	36	22	36	35	34	37	33	31	
0.03125		33	33	37	34	32						
0.0625		32	35	36	35	34						
0.125		12	30	18	37							
0.25		37	18	19	22	37						
0.5		36	38	33	37	35						
1		22	21	34	0	23						
2		35	0	33	35	37						
4		33	31	8	34	34						
8		23	24	35	19	20						

000-428-181-4

CETIS™ v1.8.7.4

Analyst: _____ QA: _____

CETIS Analytical Report

Report Date: 02 Apr-13 09:07 (p 2 of 2)
Test Code: 1324D | 15-5743-7385

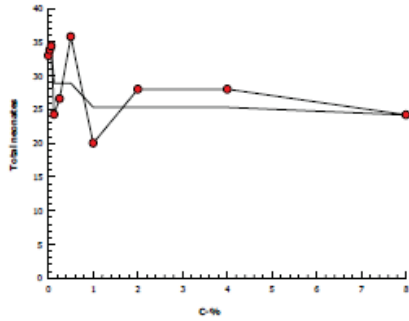
Cladoceran Reproduction Test

eriss ecotoxicology lab

Analysis ID: 20-1744-2922 Endpoint: Total neonates
Analyzed: 02 Apr-13 9:05 Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



000-428-181-4

CETIS™ v1.8.7.4

Analyst: _____ QA: _____

Attachment A2 – Test raw data and statistical analysis report (1333D)

CETIS Analytical Report

Report Date: 02 May-13 11:52 (p 1 of 2)
 Test Code: 1333D | 06-5138-4157

Cladoceran Reproduction Test			eriss ecotoxicology lab		
Analysis ID:	07-9367-4409	Endpoint:	Total neonates	CETIS Version:	CETISv1.8.7
Analyzed:	02 May-13 11:51	Analysis:	Linear Interpolation (ICPIN)	Official Results:	Yes
Batch ID:	02-8379-8349	Test Type:	Cladoceran reproduction	Analyst:	Andrew J Harford
Start Date:	20 Apr-13 13:30	Protocol:	Clad (chronic) eriss tropical freshwater	Diluent:	Upstream of Discharge
Ending Date:	26 Apr-13 13:30	Species:	Moinodaphnia macleayi	Brine:	Not Applicable
Duration:	6d 0h	Source:	In-House Culture	Age:	
Sample ID:	09-4476-6604	Code:	384FFE8C	Client:	Vista Gold
Sample Date:	22 Mar-13 16:17	Material:	RP3	Project:	Mt Todd
Receive Date:	25 Mar-13 09:00	Source:	RP3		
Sample Age:	28d 21h	Station:			

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1021000	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	2.236	3.128	1.0000	No Outliers Detected

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	0.3929	N/A	6.147	254.5	16.27	NA
IC10	4.085	N/A	4.696	24.48	21.3	NA
IC15	4.363	N/A	5.043	22.92	19.83	NA
IC20	4.656	N/A	5.412	21.48	18.48	NA
IC25	4.964	N/A	6.156	20.14	16.24	NA
IC40	5.996	0.6428	N/A	16.68	NA	155.6
IC50	6.782	1.722	N/A	14.75	NA	58.08

Total neonates Summary

C-%	Control Type	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Upstream Control	10	26.1	0	40	4.244	13.42	51.42%	0.0%
0.0625		5	13.2	0	31	6.793	15.19	115.1%	49.43%
0.125		5	30.6	21	35	2.731	6.107	19.96%	-17.24%
0.25		5	35.8	33	39	1.2	2.683	7.5%	-37.16%
0.5		5	20.2	0	36	7.539	16.66	83.46%	22.61%
1		5	25.4	3	40	6.925	15.49	60.97%	2.68%
2		5	26.6	6	36	5.98	13.37	50.27%	-1.92%
4		5	24.6	6	42	6.462	14.45	58.74%	5.75%
8		5	9.6	0	19	3.932	8.792	91.56%	63.22%

Total neonates Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Upstream Control	40	20	30	35	0	37	20	37	33	9
0.0625		0	31	0	7	28					
0.125		35	21	28	34	35					
0.25		39	33	37	33	37					
0.5		32	4	29	0	36					
1		32	3	16	36	40					
2		36	20	35	6	36					
4		18	21	42	6	36					
8		0	19	2	9	18					

000-428-181-1

CETIS™ v1.8.7.4

Analyst: _____ QA: _____

CETIS Analytical Report

Report Date: 02 May-13 11:52 (p 2 of 2)
Test Code: 1333D | 06-5138-4157

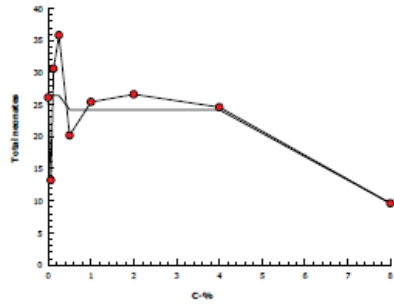
Cladoceran Reproduction Test

eriss ecotoxicology lab

Analysis ID: 07-9367-4409 Endpoint: Total neonates
Analyzed: 02 May-13 11:51 Analysis: Linear Interpolation (ICPIN)

CETIS Version: CETISv1.8.7
Official Results: Yes

Graphics



000-428-181-1

CETIS™ v1.8.7.4

Analyst: _____ QA: _____

Attachment B1 - Physico-chemical measurements of the test solutions for test 1324D

Treatment (%)	MCW		SW2		0.03125		0.0625		0.125		0.25		0.5		1.0		2.0		4.0		8.0		
Parameter	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	
Day 0	pH	6.05	6.63	6.7	8.16	6.71	7.93	6.73	7.89	6.77	8.01	6.77	7.96	6.78	8.17	6.84	8.24	6.85	8.34	6.99	8.23	7.11	8.54
	EC ($\mu\text{S cm}^{-1}$)	12	12	21	21	23	21	23	23	26	27	32	33	44	44	65	65	107	106	185	184	338	339
	DO (%)	110.7	94.7	112.7	95.9	109.2	94.4	108.1	92.2	107.9	92	103.9	93.6	104.3	95.3	101	94.6	106	94.4	102	94.3	97.7	95
	Temp ($^{\circ}\text{C}$)	22.5	21.4	22.3	21.4	22.2	21.4	22.1	21.3	21.7	21.2	21.6	21.5	21.3	21.5	21.1	21.4	21	21.3	20.8	21.2	20.8	21.2
Day 1	pH	5.82	6.65	6.82	8.27	6.78	7.99	6.81	8.19	6.81	8.83	6.84	8.27	6.84	8.37	6.88	8.34	6.92	8.47	7.01	8.37	7.06	8.49
	EC ($\mu\text{S cm}^{-1}$)	13	12	21	21	23	22	25	24	28	27	33	32	44	45	66	66	107	108	186	185	335	339
	DO (%)	103.5	94	106.7	97.7	106.3	96.2	104.5	93	104.6	95	104.4	97.6	102.7	98.6	102.8	98.5	102.4	94.1	104	89.2	105.6	99
	Temp ($^{\circ}\text{C}$)	21.8	24.3	21.7	24.6	21.7	24.4	21.7	24.4	21.7	24.3	21.1	23.8	20.6	23.9	20.6	23.9	20.5	23.5	20.3	23.4	20.3	23.1
Day 2	pH	6.07	6.39	6.89	7.54	6.85	7.65	6.75	7.55	6.68	7.84	6.86	7.72	6.86	7.66	6.89	7.87	6.92	7.75	6.97	7.95	7.06	7.87
	EC ($\mu\text{S cm}^{-1}$)	13	12	22	21	23	22	24	24	27	27	33	32	44	45	66	66	108	109	185	189	333	342
	DO (%)	102.1	92.4	103.1	96.2	105.3	95.8	107.3	95.6	105.3	91.3	106.3	97.5	107.1	95.9	103.5	97.4	106.6	101.9	107.4	95.6	100.3	95.1
	Temp ($^{\circ}\text{C}$)	23	23.3	22	23.6	21.4	23.1	21.3	24.4	21	22.8	21	22.5	20.8	22.7	20.6	22.5	20.6	22.4	20.5	22	20.6	21.5
Day 3	pH	6.2	6.42	6.91	7.66	6.86	7.76	6.88	7.55	6.88	8.02	6.92	7.76	6.97	8.05	7	7.75	7	8.36	7.1	8.11	7.18	8.19
	EC ($\mu\text{S cm}^{-1}$)	14	11	22	21	24	22	24	24	27	27	32	32	45	45	65	67	105	109	186	189	336	341
	DO (%)	103.9	94.3	101.1	98.5	103.6	96	103.7	95.6	101.6	98.9	104.3	99.7	98.9	99.1	99.3	100.1	100.3	103.8	101.5	100.3	99.7	98.9
	Temp ($^{\circ}\text{C}$)	24.2	22.9	23.9	23.1	22.5	23	22.6	21.3	22.5	23.1	22	23.5	22	23.8	21.9	23.6	21.6	23.3	21.4	22.9	21.3	23
Day 4	pH	5.89	6.33	6.62	7.2	6.69	7.22	6.74	7.49	6.76	7.29	6.71	7.28	6.81	7.33	6.85	7.35	6.9	7.51	6.91	7.51	6.94	7.49
	EC ($\mu\text{S cm}^{-1}$)	13	12	21	21	23	22	24	23	28	28	32	33	45	45	66	67	108	109	186	189	336	349
	DO (%)	116.2	90.3	118.6	92.1	121.2	92.8	119.3	96.1	117.6	92.5	117.5	91.2	112.5	91.8	109.1	87.2	117	89.9	118.9	89.1	111.6	86.7
	Temp ($^{\circ}\text{C}$)	22.9	22.2	22.8	22.1	22.9	21.8	22.7	22.9	22.6	22.6	22.6	22.2	22	22.2	21.7	21.9	21.3	21.8	21.1	21.4	21.3	21.2
Day 5	pH	5.99	6.17	6.87	7.09	6.83	7.09	6.84	7.22	6.85	7.15	6.87	7.13	6.95	7.14	6.98	7.12	7.07	7.27	7.09	7.23	7.18	7.39
	EC ($\mu\text{S cm}^{-1}$)	13	12	22	22	23	22	25	24	27	27	32	32	45	45	67	66	107	109	186	188	336	342
	DO (%)	108.2	90.3	110.9	91.7	110.7	91.7	111.6	89.7	104.6	93.1	103.9	93.6	101.5	88.9	96.9	90.4	96.8	90.6	98.8	86.2	96.6	88.3
	Temp ($^{\circ}\text{C}$)	25.6	23.8	25.4	24	24.7	24	24.9	21.8	24.8	23.6	23.3	23.7	22.1	23.5	21.6	23.3	21	22.3	20.8	23.1	20.6	23.1

Attachment B2 - Physico-chemical measurements of the test solutions for test 1333D

Treatment (%)		MCW		SW2		0.0625		0.125		0.25		0.5		1.0		2.0		4.0		8.0	
Parameter		0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h	0 h	24 h
Day 0	pH	6.4	7.7	6.8	8.5	6.7	8.4	6.8	8.3	6.8	8.4	6.8	8.4	6.8	8.4	6.9	8.6	6.9	8.6	7.0	8.7
	EC ($\mu\text{S cm}^{-1}$)	19	17	22	22	26	24	28	27	33	33	45	44	66	67	108	110	191	191	340	337
	DO (%)	109.1	95.2	106.3	98.0	111.1	99.9	107.0	92.8	105.5	98.0	110.0	97.5	111.5	98.9	109.3	97.2	107.4	100.5	106.9	104.2
	Temp ($^{\circ}\text{C}$)	23.9	23.5	23.8	23.7	23.8	23.9	23.8	23.7	23.6	23.6	23.0	23.3	23.0	23.5	22.9	23.6	22.8	23.7	22.6	23.5
Day 1	pH	6.4	8.0	6.8	8.6	6.8	8.5	6.9	8.4	6.9	8.6	6.9	8.5	6.9	8.7	7.0	8.7	7.0	8.8	7.2	8.8
	EC ($\mu\text{S cm}^{-1}$)	18	18	22	21	24	24	26	26	33	33	45	44	66	67	109	110	189	188	335	338
	DO (%)	105.5	97.3	111.2	101.5	111.6	99.8	107.0	97.2	106.3	101.2	106.0	102.4	112.4	105.1	110.7	104.7	111.5	102.6	106.2	101.9
	Temp ($^{\circ}\text{C}$)	23.5	23.8	23.0	24.4	22.9	24.1	22.8	23.6	22.5	24.8	23.7	25.0	23.4	24.7	22.8	24.6	22.5	23.9	22.4	23.9
Day 2	pH	6.6	7.8	7.0	8.3	7.0	8.2	7.0	8.0	7.0	8.2	7.0	8.0	7.0	7.9	7.1	8.0	7.1	8.1	7.2	8.2
	EC ($\mu\text{S cm}^{-1}$)	18	16	21	21	25	25	27	26	33	32	44	44	66	68	110	110	189	191	336	340
	DO (%)	108.1	101.7	105.7	100.0	108.2	100.7	105.5	102.2	107.7	101.9	102.4	100.4	107.9	99.4	101.5	99.9	104.4	98.2	102.2	99.9
	Temp ($^{\circ}\text{C}$)	24.0	25.8	23.4	26.1	22.6	26.1	22.5	25.9	22.4	25.9	22.1	25.3	21.8	25.1	21.5	24.8	21.5	24.6	21.4	24.3
Day 3	pH	6.9	7.7	7.0	8.4	7.1	8.5	7.1	8.5	7.1	8.5	7.0	8.5	6.8	8.5	7.3	8.6	7.2	8.6	7.3	0.0
	EC ($\mu\text{S cm}^{-1}$)	17	16	21	21	25	24	27	27	33	33	44	45	67	66	109	109	189	190	335	337
	DO (%)	109.4	92.0	118.1	95.1	113.3	98.0	117.3	91.9	113.2	96.7	109.5	94.3	111.8	93.0	100.6	96.9	111.3	97.0	110.2	93.0
	Temp ($^{\circ}\text{C}$)	27.3	21.2	27.3	21.4	26.4	21.0	26.4	21.0	26.1	21.4	25.8	21.2	25.6	21.1	25.3	21.0	25.1	21.0	24.7	21.0
Day 4	pH	6.6	7.0	6.9	7.6	6.9	7.9	7.0	7.4	7.0	7.6	7.0	7.6	7.0	7.5	7.1	7.6	7.1	7.6	7.2	8.2
	EC ($\mu\text{S cm}^{-1}$)	18	15	21	21	25	25	27	26	33	33	44	44	67	67	110	111	190	194	336	342
	DO (%)	104.9	89.3	108.3	97.1	104.6	94.2	109.7	94.5	107.1	90.9	101.0	92.7	106.3	93.8	106.2	95.9	107.4	94.9	106.1	93.5
	Temp ($^{\circ}\text{C}$)	24.9	23.1	25.3	23.4	25.3	22.8	25.1	22.9	24.9	22.7	24.5	22.4	24.4	22.6	24.0	22.3	23.9	21.9	23.3	21.6
Day 5	pH	6.7	7.0	6.9	8.0	7.1	8.0	6.9	8.2	7.0	8.3	7.1	8.2	6.9	8.5	7.3	8.6	7.2	8.5	7.1	8.7
	EC ($\mu\text{S cm}^{-1}$)	16	17	21	21	24	24	27	27	33	33	44	44	66	68	108	110	186	190	334	338
	DO (%)	101.7	103.6	101.5	109.5	101.5	107.3	103.9	111.6	101.1	108.8	99.5	109.1	107.3	108.8	102.8	109.8	106.9	107.6	102.4	108.7
	Temp ($^{\circ}\text{C}$)	22.9	23.6	23.1	23.9	22.8	24.1	22.6	23.9	21.8	23.0	22.1	23.0	22.1	22.4	21.9	22.6	21.7	22.2	21.1	22.2

Attachment C - Metal and major ion analyses of QA/QC waters

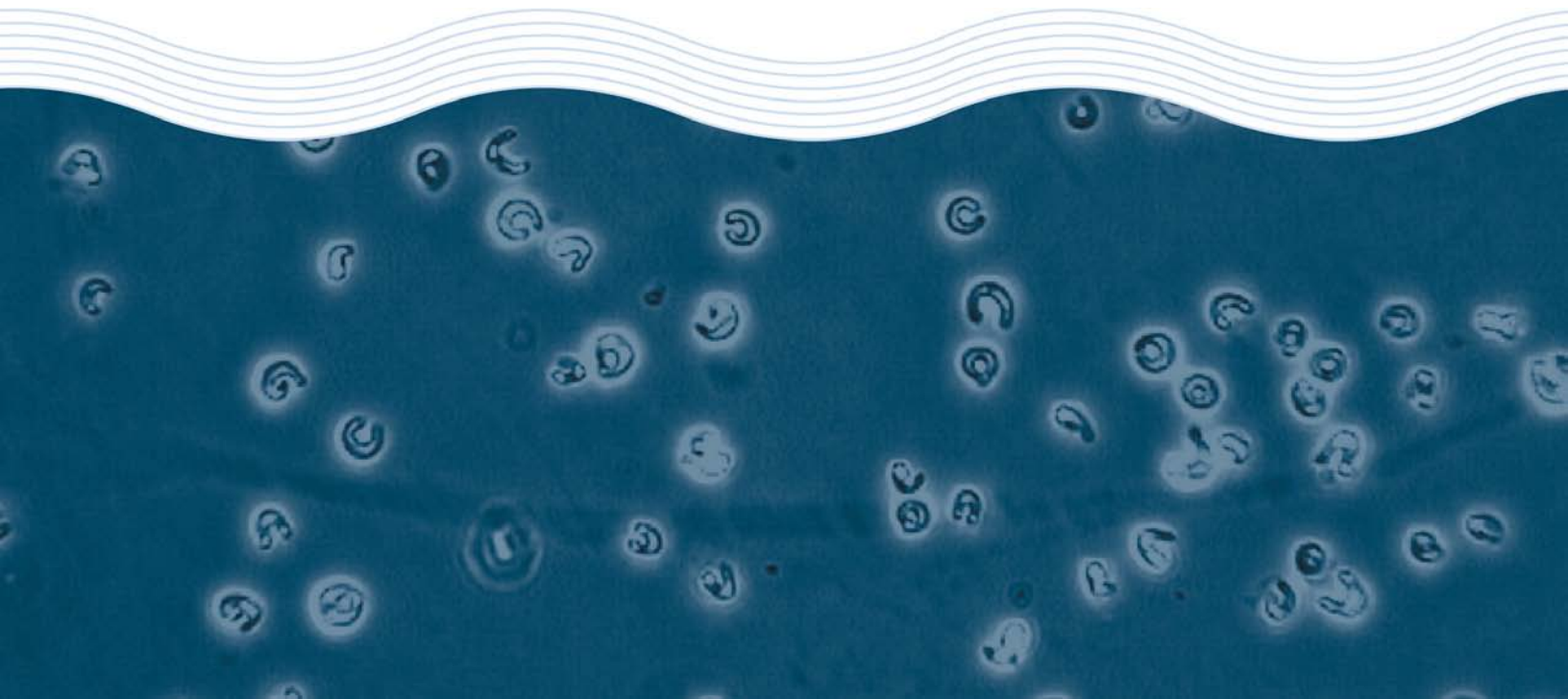
Elements	Units	Sample ID			
		1324D P. BIK	1324D BIK	1333D P. BIK	1333D BIK
Aluminium	µg L ⁻¹	<0.5	0.24	0.78	<0.1
Cadmium	µg L ⁻¹	<0.1	<0.02	<0.02	<0.02
Cobalt	µg L ⁻¹	<0.02	<0.01	<0.01	<0.01
Chromium	µg L ⁻¹	<0.01	<0.1	<0.1	<0.1
Copper	µg L ⁻¹	<0.1	0.082	0.099	0.083
Iron	µg L ⁻¹	0.083	<1	<1	<1
Manganese	µg L ⁻¹	<1	0.012	<0.01	<0.01
Nickel	µg L ⁻¹	<0.01	0.15	0.047	0.043
Lead	µg L ⁻¹	0.16	<0.01	0.073	<0.01
Selenium	µg L ⁻¹	<0.01	<0.2	<0.2	<0.2
Uranium	µg L ⁻¹	<0.2	0.001	0.001	<0.001
Zinc	µg L ⁻¹	<0.001	<0.1	<0.1	<0.1
Sodium	mg L ⁻¹	<0.1	<0.1	<0.1	<0.1
Calcium	mg L ⁻¹	<0.1	<0.1	<0.1	<0.1
Magnesium	µm L ⁻¹	<0.1	<0.1	<0.1	<0.1
Sulphate, SO ₄	mg L ⁻¹ L	<0.1	<0.5	<0.5	<0.5

Toxicity Assessment of a Treated Water Sample

Vista Gold Australia Pty Ltd

Test Report

March 2013



Toxicity Assessment of a Treated Water Sample

Vista Gold Australia Pty Ltd

Test Report

March 2013

Toxicity Test Report: TR1022/1

(page 1 of 2)

This document is issued in accordance with NATA's accreditation requirements

Client:	Vista Gold Pty Ltd PO Box 1616 Katherine NT 0851	ESA Job #:	PR1022
Attention:	Andrew Sawicki	Date Sampled:	Not supplied
Client Ref:	Not supplied	Date Received:	14 and 23 March 2013
		Sampled By:	Client
		ESA Quote #:	PL1022_q01

Lab ID No.:	Sample Name:	Sample Description:
5921	SW2	Aqueous sample, pH 7.4, conductivity 20.1 μ S/cm, total ammonia <2.0mg/L*. Sample received at room temperature in apparent good condition.
5929	RP3	Aqueous sample, pH 9.0, conductivity 2690 μ S/cm, total ammonia <2.0mg/L*. Sample received at room temperature in apparent good condition.

*Ammonia analysis is not covered by Ecotox Services Australasia's scope of accreditation

Test Performed:	72-hr microalgal growth inhibition test using the green alga <i>Chlorella vulgaris</i>
Test Protocol:	ESA SOP 103 (ESA 2011), based on USEPA (2002)
Test Temperature:	The test was performed at 29 \pm 1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The samples were filtered to 0.45 μ m prior to use. Sample RP3 was serially diluted with sample SW2 to achieve the test concentrations. A USEPA control and a diluent control (SW2) were tested concurrently with the sample.
Source of Test Organisms:	ESA Laboratory culture, originally sourced from CSIRO Microalgal Supply Service, TAS
Test Initiated:	25 March 2013 at 1430h


Sample 5929 : RP3	Concentration (%)	Cell Yield $\times 10^4$ cells/mL (Mean \pm SD)	Vacant	Vacant
USEPA Control		107.2 \pm 5.0		
Diluent Control		102.5 \pm 8.1		
	0.8	85.6 \pm 7.1 *		
	1.6	86.8 \pm 4.9 *		
	3.1	89.9 \pm 12.5		
	6.3	69.3 \pm 14.6 *		
	12.5	70.3 \pm 6.5 *		
	25	62.3 \pm 7.5 *		
	50	65.9 \pm 6.0 *		
	100	75.1 \pm 4.1 *		
72-hr IC10 = <0.8% 72-hr IC50 = >100% NOEC = 3.1% LOEC = 6.3%				

*Significantly lower cell yield compared with the Diluent Control (Dunnett's Test, 1-tailed, P=0.05)

Toxicity Test Report: TR1022/1

(page 2 of 2)

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean cell density	$\geq 16.0 \times 10^4$ cells/mL	108.2×10^4 cells/mL	Yes
Control coefficient of variation	<20%	4.9%	Yes
Reference Toxicant within cusum chart limits	0.3-3.4g KCl/L	1.1g KCl/L	Yes

Test Report Authorised by: 

Dr Rick Krassoi, Director on 9 May 2013

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

ESA (2011) *ESA SOP 103 – Green Alga, Selenastrum capricornutum, Growth Test*. Issue No 9. Ecotox Services Australasia, Sydney, NSW.

USEPA (2002) *Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms*. Fourth Edition. EPA-821-R-02-013. United States Environmental Protection Agency, Office of Research and Development, Washington DC, USA,

Toxicity Test Report: TR1022/2

(page 1 of 2)

This document is issued in accordance with NATA's accreditation requirements

Client:	Vista Gold Pty Ltd PO Box 1616 Katherine NT 0851	ESA Job #:	PR1022
Attention:	Andrew Sawicki	Date Sampled:	Not supplied
Client Ref:	Not supplied	Date Received:	14 and 23 March 2013
		Sampled By:	Client
		ESA Quote #:	PL1022_q01

Lab ID No.:	Sample Name:	Sample Description:
5921	SW2	Aqueous sample, pH 7.4, conductivity 20.1 μ S/cm, total ammonia <2.0mg/L*. Sample received at room temperature in apparent good condition.
5929	RP3	Aqueous sample, pH 9.0, conductivity 2690 μ S/cm, total ammonia <2.0mg/L*. Sample received at room temperature in apparent good condition.

*Ammonia analysis is not covered by Ecotox Services Australasia's scope of accreditation

Test Performed:	96-hr Growth inhibition of the freshwater aquatic duckweed <i>Lemna aequinoctialis</i>
Test Protocol:	ESA SOP 112 (ESA 2011), based on OECD method 221 (2006)
Test Temperature:	The test was performed at 29 \pm 1°C.
Deviations from Protocol:	The test was extended to 120 days
Comments on Solution Preparation:	Sample RP3 was serially diluted with sample SW2 to achieve the test concentrations. A SIS (media) control and a diluent control (SW2) were tested concurrently with the sample.
Source of Test Organisms:	ESA Laboratory culture
Test Initiated:	28 March 2013 at 1445h

Sample 5929: RP3 Concentration (%)	Specific Growth Rate (Mean \pm SD)	Vacant	Vacant
SIS Control	0.25 \pm 0.07		
Diluent Control	0.26 \pm 0.02		
3.1	0.24 \pm 0.01		
6.1	0.24 \pm 0.02		
12.1	0.23 \pm 0.03		
24.2	0.23 \pm 0.03		
48.4	0.17 \pm 0.07 *		
96.8	0.10 \pm 0.07 *		
120-hr IC10 = 10.2%** 120-hr IC50 = 75.4%** NOEC = 24.2% LOEC = 48.4%			

*Significantly lower specific growth rate compared with the Diluent Control (Steel's Many-One Rank Test, 1-tailed, P=0.05)

**95% confidence limits not reliable

Toxicity Test Report: TR1022/2

(page 2 of 2)

QA/QC Parameter	Criterion	This Test	Criterion met?
Control frond doubling time	<3 days	2.7 days	Yes
Reference Toxicant within cusum chart limits	7.7-61.0 MgSO ₄ /L	12.7mg MgSO ₄ /L	Yes

Test Report Authorised by:



Dr Rick Krassoi, Director on 9 May 2013

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

ESA (2011) *SOP 112 – Duckweed Growth Inhibition Test*. Issue No. 3. Ecotox Services Australasia, Sydney NSW

OECD (2006) *Lemna sp.* Growth Inhibition Test. Method 221. OECD Guideline for the Testing of Chemicals. Organisation for Economic Cooperation and Development, Paris

Toxicity Test Report: TR1022/3

(page 1 of 2)

This document is issued in accordance with NATA's accreditation requirements

Client:	Vista Gold Pty Ltd PO Box 1616 Katherine NT 0851	ESA Job #:	PR1022
Attention:	Andrew Sawicki	Date Sampled:	Not supplied
Client Ref:	Not supplied	Date Received:	14 and 23 March 2013
		Sampled By:	Client
		ESA Quote #:	PL1022_q01

Lab ID No.:	Sample Name:	Sample Description:
5921	SW2	Aqueous sample, pH 7.4, conductivity 20.1 µS/cm, total ammonia <2.0mg/L*. Sample received at room temperature in apparent good condition.
5929	RP3	Aqueous sample, pH 9.0, conductivity 2690µS/cm, total ammonia <2.0mg/L*. Sample received at room temperature in apparent good condition.

*Ammonia analysis is not covered by Ecotox Services Australasia's scope of accreditation

Test Performed:	48-hr acute (survival) toxicity test using the freshwater chironomid <i>Chironomus tepperi</i>
Test Protocol:	ESA SOP 121 (ESA 2012), based on OECD (2011) USEPA (2002) and Bailey <i>et al.</i> (2000)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sample RP3 was serially diluted with sample SW2 to achieve the test concentrations. A Dilute Mineral Water (DMW) control and a diluent control were tested concurrently with the sample.
Source of Test Organisms:	ESA Laboratory culture
Age of Test Organisms:	8 days
Test Initiated:	27 March 2013 at 1130h

Sample 5929: RP3	Vacant	Vacant
Concentration (%)	% Survival (Mean ± SD)	
DMW Control	100 ± 0.0	
Diluent Control	100 ± 0.0	
6.3	100 ± 0.0	
12.5	95.0 ± 10.0	
25	95.0 ± 10.0	
50	100 ± 0.0	
100	95.0 ± 10.0	
48-hr EC10 = >100%		
48-hr EC50 = >100%		
NOEC = 100%		
LOEC = >100%		

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % survival	≥85.0%	100%	Yes
Reference Toxicant within cusum chart limits	18.0-3218.1µg Cu/L	260.5µg Cu/L	Yes

Toxicity Test Report: TR1022/3

(page 2 of 2)

Test Report Authorised by:



Dr Rick Krasso, Director on 9 May 2013

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

Bailey, H.C., Krasso, R., Elphick, J.R., Mulhall, A., Hunt, P., Tedmanson, L. and Lovell, A. (2000) Application of *Ceriodaphnia cf. dubia* for whole effluent toxicity tests in the Hawkesbury-Nepean watershed, New South Wales, Australia: method development and validation. *Environmental Toxicology and Chemistry* 19:88-93.

ESA (2012) *SOP 121 – Acute toxicity test using Chironomus tepperi*. Issue No. 1. Ecotox Services Australasia, Sydney, New South Wales.

OECD (2011) OECD Guideline for the Testing of Chemicals. Test Guideline 235: *Chironomus sp*, Acute Immobilisation Test.

USEPA (2002) *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*. 4th Ed. United States Environmental Protection Agency, Office of Water, Washington DC.

Toxicity Test Report: TR1022/4

(Page 1 of 2)

This document is issued in accordance with NATA's accreditation requirements

Client:	Vista Gold Pty Ltd PO Box 1616 Katherine NT 0851	ESA Job #:	PR01022
Attention:	Andrew Sawicki	Date Sampled:	Not supplied
Client Ref:	Not supplied	Date Received:	14 and 23 March 2013
		Sampled By:	Client
		ESA Quote #:	PL1022_q01

Lab ID No.:	Sample Name:	Sample Description:
5921	SW2	Sample RP3 was serially diluted with sample SW2 to achieve the test concentrations. A USEPA control and a diluent control (SW2) were tested concurrently with the sample.
5929	RP3	Sample RP3 was serially diluted with sample SW2 to achieve the test concentrations. A USEPA control and a diluent control (SW2) were tested concurrently with the sample.

*Ammonia analysis is not covered by Ecotox Services Australasia's scope of accreditation

Test Performed:	96-hr acute toxicity test using the freshwater hydra <i>hydra viridissima</i>
Test Protocol:	ESA SOP 125 (2012), based on Riethmuller et al. (2003)
Test Temperature:	The test was performed at 27±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sample RP3 was serially diluted with sample SW2 to achieve the test concentrations. A Laboratory Water control (2.5% mineral water) and a diluent control (SW2) were tested concurrently with the sample.
Source of Test Organisms:	ESA Laboratory culture
Test Initiated:	28 March 2013 at 1330h


Sample 5929: RP3 Concentration (%)	Population Growth Rate (Mean ± SD)	Vacant
Laboratory Water Control	0.40 ± 0.01	
Diluent Control	0.41 ± 0.01	
3.1	0.40 ± 0.02	
6.3	0.40 ± 0.01	
12.5	0.40 ± 0.01	
25	0.41 ± 0.01	
50	0.40 ± 0.02	
100	0.26 ± 0.02 *	
96-hr IC10 = 61.7 (51.6-66.7)%		
96-hr IC50 = >100%		
NOEC = 50%		
LOEC = 100%		

*Significantly lower population growth rate compared with the Diluent Control (Dunnnett's Test, 1-tailed, P=0.05)

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean population growth rate	≥0.25	0.40	Yes
Reference Toxicant within cusum chart limits	1.2-15.6µg Cu/L	2.5µg Cu/L	n/a

Toxicity Test Report: TR1022/4

(Page 2 of 2)

Test Report Authorised by: 

Dr Rick Krassoi, Director on 9 May 2013

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

ESA (2012) SOP 125 –*Hydra Population Growth Test*. Issue No 1. Ecotox Services Australasia, Sydney, NSW

Riethmuller N, Camilleri C, Franklin N, Hogan A, King A, Koch A, Markich SJ, Turley C and van Dam R (2003). Green Hydra Population Growth Test. In: *Ecotoxicological testing protocols for Australian tropical freshwater ecosystems*. Supervising Scientist Report 173, Supervising Scientist, Darwin NT.

Toxicity Test Report: TR1022/5

(Page 1 of 2)

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Client:	Vista Gold Pty Ltd PO Box 1616 Katherine NT 0851 Andrew Sawicki	ESA Job #:	PR1022
Attention:	Not supplied	Date Sampled:	Not supplied
		Date Received:	14 and 23 March 2013
		Sampled By:	Client
		ESA Quote #:	PL1022_q01

Lab ID No.:	Sample Name:	Sample Description:
5921	SW2	Aqueous sample, pH 7.4, conductivity 20.1 μ S/cm, total ammonia <2.0mg/L*. Sample received at room temperature in apparent good condition.
5929	RP3	Aqueous sample, pH 9.0, conductivity 2690 μ S/cm, total ammonia <2.0mg/L*. Sample received at room temperature in apparent good condition.

*Ammonia analysis is not covered by Ecotox Services Australasia's scope of accreditation

Test Performed:	96-hr acute survival test using the freshwater shrimp <i>Macrobrachium bullatum</i>
Test Protocol:	ESA SOP 123 (ESA 2012)
Test Temperature:	The test was performed at 25 \pm 1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sample RP3 was serially diluted with sample SW2 to achieve the test concentrations. A dilute mineral water (DMW) control and a diluent control (SW2) were tested concurrently with the sample.
Source of Test Organisms:	Hatchery reared, Northern Territory
Test Initiated:	4 April 2013 at 1400h

Sample 5929: RP3	Vacant	Vacant
Concentration (%)	% Un-affected (Mean \pm SD)	
DMW Control	100 \pm 0.0	
Diluent Control	100 \pm 0.0	
6.3	85.0 \pm 19.2	
12.5	100 \pm 0.0	
25	95.0 \pm 10.0	
50	100 \pm 0.0	
100	90.0 \pm 11.6	
96-hr EC10 = >100%		
96-hr EC50 = >100%		
NOEC = 100%		
LOEC = >100%		

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % un-affected	\geq 90.0%	100%	Yes
Reference Toxicant within cusum chart limits	26.2-284.6 μ g Cu/L	137.6 μ g Cu/L	Yes

Toxicity Test Report: TR1022/5

(Page 2 of 2)

Test Report Authorised by:



Dr Rick Krasso, Director on 9 May 2013

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

ESA (2012) SOP 123 –*Acute Toxicity Test Using Freshwater Shrimp*. Issue No 2. Ecotox Services Australasia, Sydney, NSW

**Statistical Printouts for the
Chlorella Growth Inhibition Tests**

Microalgal Cell Yield-Cell Yield

Start Date: 16/04/2013 17:30 Test ID: PR1022/01 Sample ID: RP3
 End Date: 19/04/2013 16:00 Lab ID: 5929 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 103 Test Species: CV-Chlorella vulgaris
 Comments:

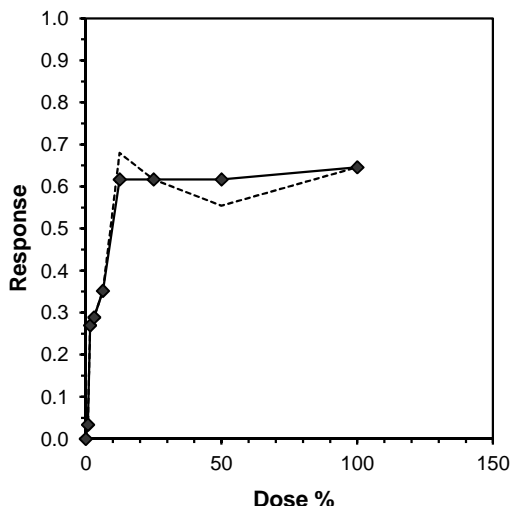
Conc-%	1	2	3	4
USEPA Control	24.683	24.683	23.183	23.683
Diluent Control	26.683	26.683	25.183	25.183
0.8	24.183	26.183	22.683	27.183
1.6	20.683	19.683	16.183	19.183
3.1	19.683	14.183	18.183	21.683
6.3	19.683	17.683	14.183	15.683
12.5	9.683	9.683	7.183	6.683
25	10.683	8.183	10.683	10.183
50	9.683	13.183	11.183	12.183
100	8.683	9.683	9.183	9.183

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
USEPA Control	24.058	0.9277	24.058	23.183	24.683	3.117	4				25.933	1.0000
Diluent Control	25.933	1.0000	25.933	25.183	26.683	3.339	4	*				
0.8	25.058	0.9663	25.058	22.683	27.183	8.044	4	0.669	2.513	3.285	25.058	0.9663
*1.6	18.933	0.7301	18.933	16.183	20.683	10.228	4	5.356	2.513	3.285	18.933	0.7301
*3.1	18.433	0.7108	18.433	14.183	21.683	17.227	4	5.738	2.513	3.285	18.433	0.7108
*6.3	16.808	0.6481	16.808	14.183	19.683	14.241	4	6.981	2.513	3.285	16.808	0.6481
*12.5	8.308	0.3204	8.308	6.683	9.683	19.268	4	13.485	2.513	3.285	9.933	0.3830
*25	9.933	0.3830	9.933	8.183	10.683	11.983	4	12.241	2.513	3.285	9.933	0.3830
*50	11.558	0.4457	11.558	9.683	13.183	12.918	4	10.998	2.513	3.285	9.933	0.3830
*100	9.183	0.3541	9.183	8.683	9.683	4.446	4	12.815	2.513	3.285	9.183	0.3541

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.979796	0.935	-0.42949	0.270188
Bartlett's Test indicates equal variances (p = 0.18)	11.39297	20.09023		
The control means are significantly different (p = 0.02)	3.273268	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	0.8	1.6	1.131371	125	3.285008	0.126672	179.0313	3.416667	1.9E-14	8, 27
Treatments vs Diluent Control										

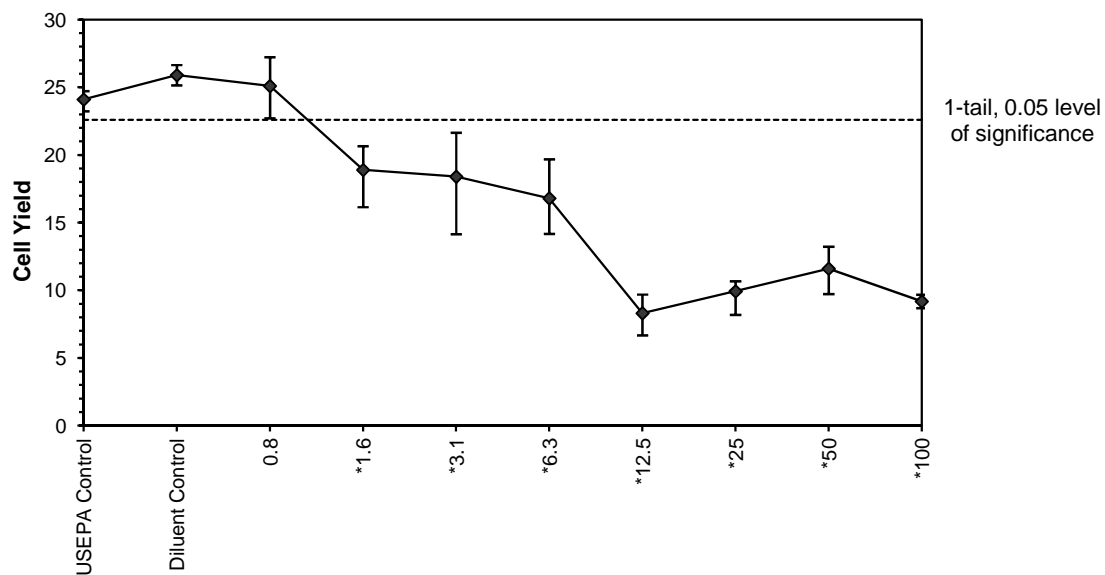
Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL(Exp)		Skew
IC05	0.8551	0.1659	0.1602	1.0349	-1.0484
IC10	1.0244	0.0944	0.6969	1.2213	-1.1385
IC15	1.1938	0.0844	0.9130	1.4431	-0.6806
IC20	1.3632	0.0888	1.0817	1.6596	-0.2356
IC25	1.5325	0.7487	1.2808	5.5072	2.0585
IC40	7.4257	0.8772	4.0182	9.2327	-1.1609
IC50	9.7644	0.5134	7.7273	10.9629	-0.7414



Microalgal Cell Yield-Cell Yield

Start Date: 16/04/2013 17:30 Test ID: PR1022/01 Sample ID: RP3
End Date: 19/04/2013 16:00 Lab ID: 5929 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 103 Test Species: CV-Chlorella vulgaris
Comments:

Dose-Response Plot



Microalgal Cell Yield-Cell Yield

Start Date:	16/04/2013 17:30	Test ID:	PR1022/01	Sample ID:	RP3
End Date:	19/04/2013 16:00	Lab ID:	5929	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 103	Test Species:	CV-Chlorella vulgaris
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Auxiliary Data Summary					N
		Mean	Min	Max	SD	CV%	
USEPA Control	Cell Yield	24.06	23.18	24.68	0.75	3.60	4
Diluent Control		25.93	25.18	26.68	0.87	3.59	4
0.8		25.06	22.68	27.18	2.02	5.67	4
1.6		18.93	16.18	20.68	1.94	7.35	4
3.1		18.43	14.18	21.68	3.18	9.67	4
6.3		16.81	14.18	19.68	2.39	9.20	4
12.5		8.31	6.68	9.68	1.60	15.23	4
25		9.93	8.18	10.68	1.19	10.98	4
50		11.56	9.68	13.18	1.49	10.57	4
100		9.18	8.68	9.68	0.41	6.96	4
USEPA Control	pH	7.50	7.50	7.50	0.00	0.00	1
Diluent Control		6.60	6.60	6.60	0.00	0.00	1
0.8		6.60	6.60	6.60	0.00	0.00	1
1.6		6.60	6.60	6.60	0.00	0.00	1
3.1		6.60	6.60	6.60	0.00	0.00	1
6.3		6.50	6.50	6.50	0.00	0.00	1
12.5		6.50	6.50	6.50	0.00	0.00	1
25		6.50	6.50	6.50	0.00	0.00	1
50		6.70	6.70	6.70	0.00	0.00	1
100		6.70	6.70	6.70	0.00	0.00	1
USEPA Control	Conductivity uS/cm	96.50	96.50	96.50	0.00	0.00	1
Diluent Control		113.00	113.00	113.00	0.00	0.00	1
0.8		137.20	137.20	137.20	0.00	0.00	1
1.6		162.40	162.40	162.40	0.00	0.00	1
3.1		212.00	212.00	212.00	0.00	0.00	1
6.3		315.00	315.00	315.00	0.00	0.00	1
12.5		513.00	513.00	513.00	0.00	0.00	1
25		877.00	877.00	877.00	0.00	0.00	1
50		1548.00	1548.00	1548.00	0.00	0.00	1
100		2800.00	2800.00	2800.00	0.00	0.00	1

Microalgal Cell Yield-Cell Yield

Start Date: 25/03/2013 14:30 Test ID: PR1022/01 Sample ID: RP3
 End Date: 28/03/2013 15:30 Lab ID: 5929 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 103 Test Species: CV-Chlorella vulgaris
 Comments:

Conc-%	1	2	3	4
USEPA Control	114.00	103.20	108.00	103.60
Diluent Control	94.80	96.40	110.80	108.00
0.8	80.40	80.80	95.60	85.60
1.6	90.80	84.80	90.80	80.80
3.1	107.60	82.00	89.60	80.40
6.3	72.40	69.60	50.00	85.20
12.5	75.20	76.00	62.40	67.60
25	54.00	70.80	66.00	58.40
50	70.00	66.80	69.60	57.20
100	73.20	76.00	70.80	80.40

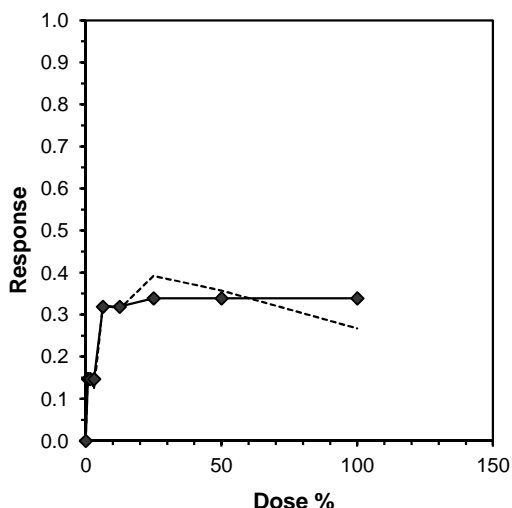
Conc-%	Transform: Untransformed							1-Tailed			Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
USEPA Control	107.20	1.0459	107.20	103.20	114.00	4.690	4					
Diluent Control	102.50	1.0000	102.50	94.80	110.80	7.878	4	*			102.50	1.0000
*0.8	85.60	0.8351	85.60	80.40	95.60	8.263	4	2.796	2.513	15.19	87.44	0.8530
*1.6	86.80	0.8468	86.80	80.80	90.80	5.644	4	2.597	2.513	15.19	87.44	0.8530
3.1	89.90	0.8771	89.90	80.40	107.60	13.864	4	2.085	2.513	15.19	87.44	0.8530
*6.3	69.30	0.6761	69.30	50.00	85.20	20.993	4	5.493	2.513	15.19	69.80	0.6810
*12.5	70.30	0.6859	70.30	62.40	76.00	9.226	4	5.327	2.513	15.19	69.80	0.6810
*25	62.30	0.6078	62.30	54.00	70.80	12.084	4	6.651	2.513	15.19	67.77	0.6611
*50	65.90	0.6429	65.90	57.20	70.00	9.062	4	6.055	2.513	15.19	67.77	0.6611
*100	75.10	0.7327	75.10	70.80	80.40	5.490	4	4.533	2.513	15.19	67.77	0.6611

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.977411	0.935	0.079448	0.566161
Bartlett's Test indicates equal variances (p = 0.49)	7.397374	20.09023		
The control means are not significantly different (p = 0.36)	0.988142	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	3.1	6.3	4.419276	32.25806	15.19206	0.148211	704.87	73.07407	3.3E-06	8, 27
Treatments vs Diluent Control										

Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL(Exp)		Skew
IC05*	0.2721	0.3224	0.1516	0.9000	8.0882
IC10*	0.5443	0.8725	0.3031	5.2002	2.5438
IC15	3.1560	1.4812	0.0000	5.1735	-0.0361
IC20	4.0861	1.2143	0.0000	7.3545	-0.5704
IC25	5.0162	1.6677	3.1691	13.2260	2.1956
IC40	>100				
IC50	>100				

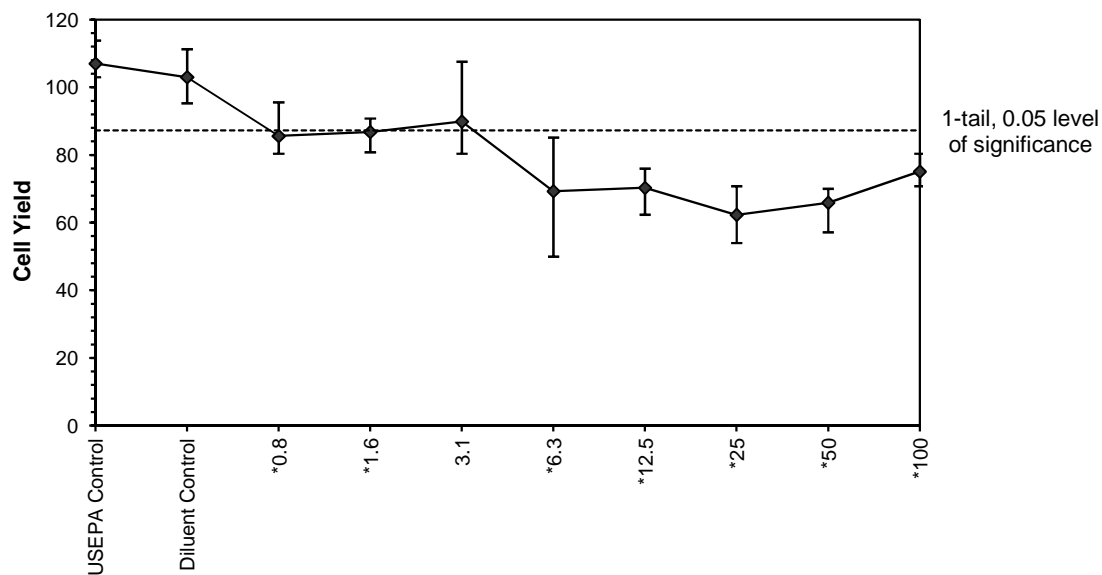
* indicates IC estimate less than the lowest concentration



Microalgal Cell Yield-Cell Yield

Start Date: 25/03/2013 14:30 Test ID: PR1022/01 Sample ID: RP3
End Date: 28/03/2013 15:30 Lab ID: 5929 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 103 Test Species: CV-Chlorella vulgaris
Comments:

Dose-Response Plot



Microalgal Cell Yield-Cell Yield

Start Date:	25/03/2013 14:30	Test ID:	PR1022/01	Sample ID:	RP3
End Date:	28/03/2013 15:30	Lab ID:	5929	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 103	Test Species:	CV-Chlorella vulgaris
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Auxiliary Data Summary					
		Mean	Min	Max	SD	CV%	N
USEPA Control	Cell Yield	107.20	103.20	114.00	5.03	2.09	4
Diluent Control		102.50	94.80	110.80	8.08	2.77	4
0.8		85.60	80.40	95.60	7.07	3.11	4
1.6		86.80	80.80	90.80	4.90	2.55	4
3.1		89.90	80.40	107.60	12.46	3.93	4
6.3		69.30	50.00	85.20	14.55	5.50	4
12.5		70.30	62.40	76.00	6.49	3.62	4
25		62.30	54.00	70.80	7.53	4.40	4
50		65.90	57.20	70.00	5.97	3.71	4
100		75.10	70.80	80.40	4.12	2.70	4
USEPA Control	pH	7.50	7.50	7.50	0.00	0.00	1
Diluent Control		7.40	7.40	7.40	0.00	0.00	1
0.8		7.40	7.40	7.40	0.00	0.00	1
1.6		7.30	7.30	7.30	0.00	0.00	1
3.1		7.40	7.40	7.40	0.00	0.00	1
6.3		7.40	7.40	7.40	0.00	0.00	1
12.5		7.50	7.50	7.50	0.00	0.00	1
25		7.50	7.50	7.50	0.00	0.00	1
50		7.80	7.80	7.80	0.00	0.00	1
100		8.50	8.50	8.50	0.00	0.00	1
USEPA Control	Conductivity uS/cm	95.00	95.00	95.00	0.00	0.00	1
Diluent Control		115.80	115.80	115.80	0.00	0.00	1
0.8		163.60	163.60	163.60	0.00	0.00	1
1.6		210.00	210.00	210.00	0.00	0.00	1
3.1		296.00	296.00	296.00	0.00	0.00	1
6.3		454.00	454.00	454.00	0.00	0.00	1
12.5		538.00	538.00	538.00	0.00	0.00	1
25		867.00	867.00	867.00	0.00	0.00	1
50		1661.00	1661.00	1661.00	0.00	0.00	1
100		2820.00	2820.00	2820.00	0.00	0.00	1

Statistical Printouts for the Duckweed Growth Inhibition Tests

Duckweed Growth Inhibition Test-Specific Growth Rate

Start Date: 28/03/2013 14:45	Test ID: PR1022/2	Sample ID: RP3
End Date: 2/04/2013 10:00	Lab ID: 5922	Sample Type: AQ-Aqueous
Sample Date:	Protocol: ESA 112	Test Species: LA-Lemna aequinoctialis

Conc-%	1	2	3	4
CAAC Control	0.2464	0.3486	0.1889	0.2290
Diluent Control	0.2624	0.2624	0.2773	0.2290
3.1	0.2197	0.2379	0.2379	0.2464
6.1	0.2546	0.2624	0.2197	0.2379
12.1	0.2624	0.1997	0.1997	0.2464
24.2	0.2290	0.2464	0.1889	0.2546
48.4	0.0713	0.1997	0.2197	0.1775
96.8	0.0000	0.0904	0.1653	0.1386

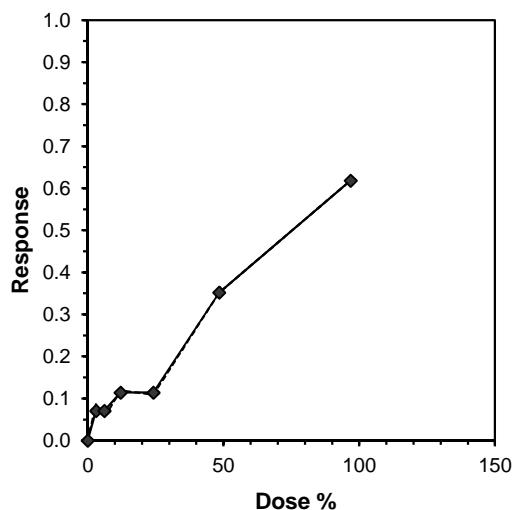
Conc-%	Transform: Untransformed							Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
CAAC Control	0.2532	0.9823	0.2532	0.1889	0.3486	26.846	4				
Diluent Control	0.2578	1.0000	0.2578	0.2290	0.2773	7.917	4	*		0.2578	1.0000
3.1	0.2355	0.9135	0.2355	0.2197	0.2464	4.779	4	13.00	10.00	0.2396	0.9294
6.1	0.2437	0.9452	0.2437	0.2197	0.2624	7.780	4	14.00	10.00	0.2396	0.9294
12.1	0.2271	0.8808	0.2271	0.1997	0.2624	14.210	4	13.00	10.00	0.2284	0.8860
24.2	0.2297	0.8912	0.2297	0.1889	0.2546	12.728	4	12.50	10.00	0.2284	0.8860
*48.4	0.1671	0.6480	0.1671	0.0713	0.2197	39.572	4	10.00	10.00	0.1671	0.6480
*96.8	0.0986	0.3824	0.0986	0.0000	0.1653	73.715	4	10.00	10.00	0.0986	0.3824

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.918283	0.924	-1.05017	1.884819
Bartlett's Test indicates equal variances (p = 0.04)	13.23951	16.81189		
The control means are not significantly different (p = 0.90)	0.128332	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	24.2	48.4	34.22397	4.132231
Treatments vs Diluent Control				

Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL(Exp)		Skew
IC05*	2.194	6.318	0.671	38.175	2.1205
IC10	10.163	9.623	0.000	42.883	0.4692
IC15	27.861	8.658	0.000	52.718	-0.0754
IC20	32.946	7.951	14.790	63.069	0.9616
IC25	38.030	8.624	21.576	73.158	0.9201
IC40	57.153				
IC50	75.377				

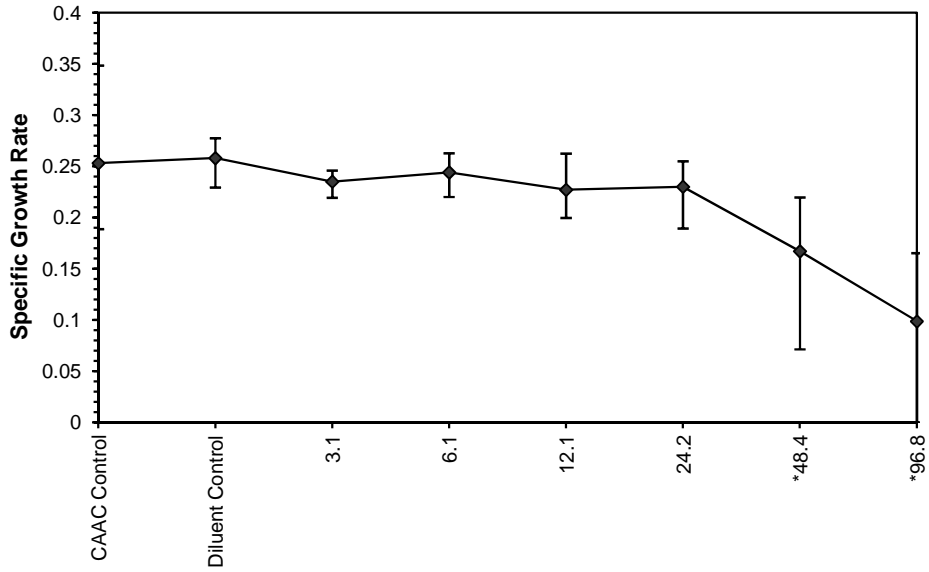
* indicates IC estimate less than the lowest concentration



Duckweed Growth Inhibition Test-Specific Growth Rate

Start Date: 28/03/2013 14:45 Test ID: PR1022/2 Sample ID: RP3
End Date: 2/04/2013 10:00 Lab ID: 5922 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 112 Test Species: LA-Lemna aequinoctialis
Comments:

Dose-Response Plot



Duckweed Growth Inhibition Test-Specific Growth Rate

Start Date:	28/03/2013 14:45	Test ID:	PR1022/2	Sample ID:	RP3
End Date:	2/04/2013 10:00	Lab ID:	5922	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 112	Test Species:	LA-Lemna aequinoctialis
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Auxiliary Data Summary					
		Mean	Min	Max	SD	CV%	N
CAAC Control	Specific Growth Rate	0.25	0.19	0.35	0.07	102.96	4
Diluent Control		0.26	0.23	0.28	0.02	55.42	4
3.1		0.24	0.22	0.25	0.01	45.05	4
6.1		0.24	0.22	0.26	0.02	56.51	4
12.1		0.23	0.20	0.26	0.03	79.11	4
24.2		0.23	0.19	0.25	0.03	74.43	4
48.4		0.17	0.07	0.22	0.07	153.91	4
96.8		0.10	0.00	0.17	0.07	273.44	4
CAAC Control		pH	5.90	5.90	5.90	0.00	0.00
Diluent Control	6.70		6.70	6.70	0.00	0.00	1
3.1	6.80		6.80	6.80	0.00	0.00	1
6.1	6.90		6.90	6.90	0.00	0.00	1
12.1	6.90		6.90	6.90	0.00	0.00	1
24.2	7.10		7.10	7.10	0.00	0.00	1
48.4	7.30		7.30	7.30	0.00	0.00	1
96.8	8.30		8.30	8.30	0.00	0.00	1
CAAC Control	Cond uS/cm		35.80	35.80	35.80	0.00	0.00
Diluent Control		52.80	52.80	52.80	0.00	0.00	1
3.1		189.80	189.80	189.80	0.00	0.00	1
6.1		311.00	311.00	311.00	0.00	0.00	1
12.1		532.00	532.00	532.00	0.00	0.00	1
24.2		920.00	920.00	920.00	0.00	0.00	1
48.4		1576.00	1576.00	1576.00	0.00	0.00	1
96.8		2750.00	2750.00	2750.00	0.00	0.00	1

**Statistical Printouts for the Acute
Test with *Chironomus tepperi***

Chironomid Acute Toxicity Test-48hr Survival

Start Date:	27/03/2013 11:30	Test ID:	PR1022/02	Sample ID:	RP3
End Date:	29/03/2013 11:30	Lab ID:	5929	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 121	Test Species:	CT-Chironomus tepperi

Conc-%	1	2	3	4
DMW Control	1.0000	1.0000	1.0000	1.0000
t Control (SW2)	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000
12.5	0.8000	1.0000	1.0000	1.0000
25	0.8000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	0.8000	1.0000

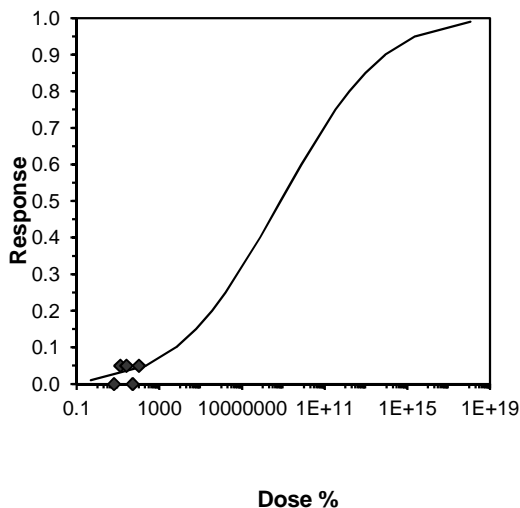
Conc-%	Mean	N-Mean	Transform: Arcsin Square Root				Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%				
DMW Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			
t Control (SW2)	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	*	0	20
6.3	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0
12.5	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1
25	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1
50	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0
100	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.668306	0.916	-1.74394	2.373016
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1
Treatments vs Diluent Control (SW2)				

Parameter	Value	SE	95% Fiducial Limits	Maximum Likelihood-Probit						
				Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	0.253136	0.599134	-0.92117 1.427438	0	2.023721	7.814728	0.57	8.871225	3.950452	4
Intercept	2.754377	0.915847	0.959316 4.549437							

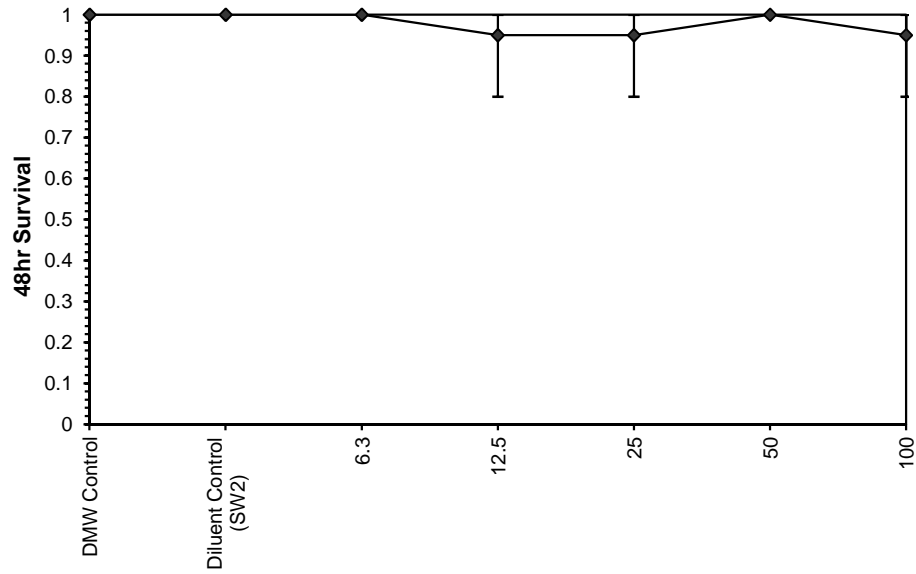
Point	Probits	%	95% Fiducial Limits
EC01	2.674	0.479845	
EC05	3.355	236.2168	
EC10	3.718	6434.549	
EC15	3.964	59819.91	
EC20	4.158	351918.1	
EC25	4.326	1609483	
EC40	4.747	74197638	
EC50	5.000	7.43E+08	
EC60	5.253	7.45E+09	
EC75	5.674	3.43E+11	
EC80	5.842	1.57E+12	
EC85	6.036	9.24E+12	
EC90	6.282	8.59E+13	
EC95	6.645	2.34E+15	
EC99	7.326	1.15E+18	



Chironomid Acute Toxicity Test-48hr Survival

Start Date: 27/03/2013 11:30 Test ID: PR1022/02 Sample ID: RP3
End Date: 29/03/2013 11:30 Lab ID: 5929 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 121 Test Species: CT-Chironomus tepperi
Comments:

Dose-Response Plot



Chironomid Acute Toxicity Test-48hr Survival

Start Date:	27/03/2013 11:30	Test ID:	PR1022/02	Sample ID:	RP3
End Date:	29/03/2013 11:30	Lab ID:	5929	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 121	Test Species:	CT-Chironomus tepperi
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Auxiliary Data Summary					
		Mean	Min	Max	SD	CV%	N
DMW Control	% Survival	100.00	100.00	100.00	0.00	0.00	4
t Control (SW2)		100.00	100.00	100.00	0.00	0.00	4
6.3		100.00	100.00	100.00	0.00	0.00	4
12.5		95.00	80.00	100.00	10.00	3.33	4
25		95.00	80.00	100.00	10.00	3.33	4
50		100.00	100.00	100.00	0.00	0.00	4
100		95.00	80.00	100.00	10.00	3.33	4
DMW Control	pH	8.00	8.00	8.00	0.00	0.00	1
t Control (SW2)		7.40	7.40	7.40	0.00	0.00	1
6.3		7.00	7.00	7.00	0.00	0.00	1
12.5		6.90	6.90	6.90	0.00	0.00	1
25		6.80	6.80	6.80	0.00	0.00	1
50		7.90	7.90	7.90	0.00	0.00	1
100		9.00	9.00	9.00	0.00	0.00	1
DMW Control	Cond uS/cm	167.30	167.30	167.30	0.00	0.00	1
t Control (SW2)		20.10	20.10	20.10	0.00	0.00	1
6.3		287.00	287.00	287.00	0.00	0.00	1
12.5		508.00	508.00	508.00	0.00	0.00	1
25		884.00	884.00	884.00	0.00	0.00	1
50		1541.00	1541.00	1541.00	0.00	0.00	1
100		2690.00	2690.00	2690.00	0.00	0.00	1
DMW Control	DO %	96.80	96.80	96.80	0.00	0.00	1
t Control (SW2)		97.10	97.10	97.10	0.00	0.00	1
6.3		98.20	98.20	98.20	0.00	0.00	1
12.5		98.60	98.60	98.60	0.00	0.00	1
25		98.80	98.80	98.80	0.00	0.00	1
50		98.60	98.60	98.60	0.00	0.00	1
100		98.90	98.90	98.90	0.00	0.00	1

Statistical Printouts for *Hydra* Population Growth Tests

Hydra Population Growth Test-Growth Rate

Start Date:	28/03/2013 13:30	Test ID:	PR1022/02	Sample ID:	RP3
End Date:	1/04/2013 11:30	Lab ID:	5929	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 125	Test Species:	HV-Hydra viridissima

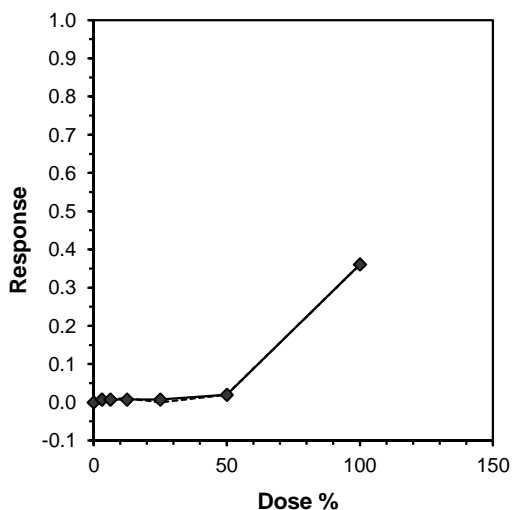
Conc-%	1	2	3	4
Lab Control	0.4069	0.3835	0.3931	0.4156
Diluent Control	0.4024	0.4241	0.4113	0.3931
3.1	0.4024	0.4024	0.3835	0.4241
6.3	0.3978	0.3931	0.4156	0.4113
12.5	0.4024	0.4156	0.3883	0.4069
25	0.3978	0.4113	0.4113	0.4113
50	0.3931	0.4241	0.3931	0.3883
100	0.2894	0.2508	0.2590	0.2424

Conc-%	Transform: Untransformed							t-Stat	1-Tailed Critical	MSD	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N				Mean	N-Mean
Lab Control	0.3998	0.9805	0.3998	0.3835	0.4156	3.572	4					
Diluent Control	0.4077	1.0000	0.4077	0.3931	0.4241	3.241	4	*			0.4077	1.0000
3.1	0.4031	0.9886	0.4031	0.3835	0.4241	4.120	4	0.459	2.451	0.0248	0.4047	0.9926
6.3	0.4044	0.9920	0.4044	0.3931	0.4156	2.653	4	0.323	2.451	0.0248	0.4047	0.9926
12.5	0.4033	0.9892	0.4033	0.3883	0.4156	2.826	4	0.437	2.451	0.0248	0.4047	0.9926
25	0.4079	1.0005	0.4079	0.3978	0.4113	1.657	4	-0.019	2.451	0.0248	0.4047	0.9926
50	0.3997	0.9802	0.3997	0.3883	0.4241	4.117	4	0.796	2.451	0.0248	0.3997	0.9802
*100	0.2604	0.6387	0.2604	0.2424	0.2894	7.865	4	14.570	2.451	0.0248	0.2604	0.6387

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.955214	0.924	0.611284	-0.10941
Bartlett's Test indicates equal variances (p = 0.72)	3.690156	16.81189		
The control means are not significantly different (p = 0.45)	0.816567	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Control	50	100	70.71068	2	0.024787	0.060794	0.011875	0.000204	5.4E-12	6, 21

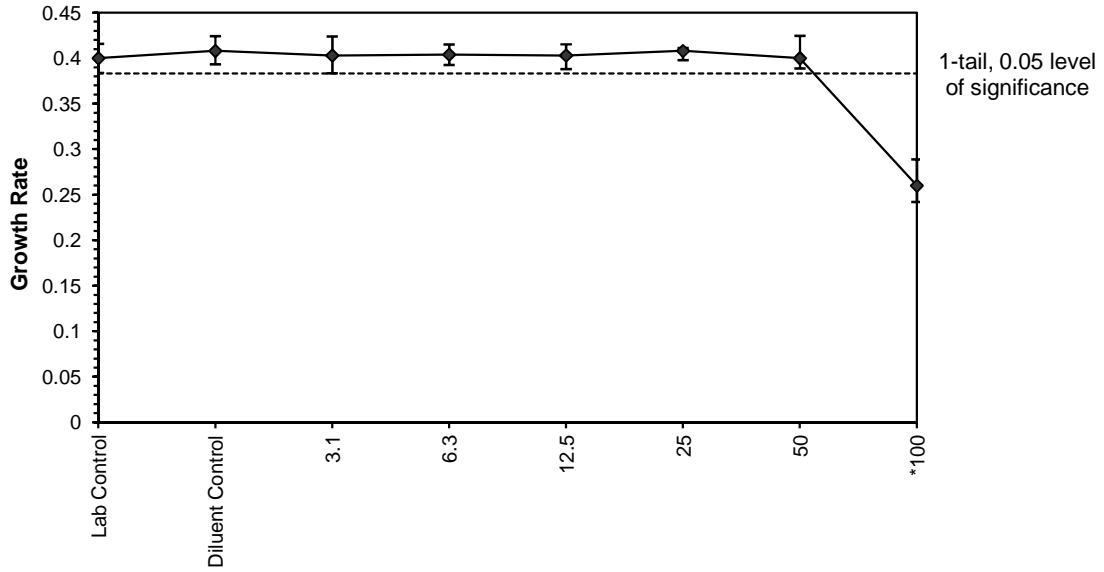
Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL(Exp)		Skew
IC05	54.428	5.903	27.169	59.178	-4.1643
IC10	61.746	2.462	51.617	66.685	-0.4119
IC15	69.065	2.356	59.856	74.330	-0.2298
IC20	76.384	2.391	67.368	82.405	-0.0335
IC25	83.702	2.560	74.900	90.263	0.1413
IC40	>100				
IC50	>100				



Hydra Population Growth Test-Growth Rate

Start Date: 28/03/2013 13:30 Test ID: PR1022/02 Sample ID: RP3
End Date: 1/04/2013 11:30 Lab ID: 5929 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 125 Test Species: HV-Hydra viridissima
Comments:

Dose-Response Plot



Hydra Population Growth Test-Growth Rate

Start Date: 28/03/2013 13:30 Test ID: PR1022/02 Sample ID: RP3
 End Date: 1/04/2013 11:30 Lab ID: 5929 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 125 Test Species: HV-Hydra viridissima
 Comments:

Auxiliary Data Summary

Conc-%	Parameter	Auxiliary Data Summary					
		Mean	Min	Max	SD	CV%	N
Lab Control	Growth Rate	0.40	0.38	0.42	0.01	29.89	4
Diluent Control		0.41	0.39	0.42	0.01	28.20	4
3.1		0.40	0.38	0.42	0.02	31.97	4
6.3		0.40	0.39	0.42	0.01	25.61	4
12.5		0.40	0.39	0.42	0.01	26.47	4
25		0.41	0.40	0.41	0.01	20.15	4
50		0.40	0.39	0.42	0.02	32.10	4
100		0.26	0.24	0.29	0.02	54.96	4
Lab Control	Conductivity	31.40	31.40	31.40	0.00	0.00	1
Diluent Control		19.00	19.00	19.00	0.00	0.00	1
3.1		165.10	165.10	165.10	0.00	0.00	1
6.3		285.00	285.00	285.00	0.00	0.00	1
12.5		506.00	506.00	506.00	0.00	0.00	1
25		886.00	886.00	886.00	0.00	0.00	1
50		1557.00	1557.00	1557.00	0.00	0.00	1
100		2710.00	2710.00	2710.00	0.00	0.00	1
Lab Control	pH	7.50	7.50	7.50	0.00	0.00	1
Diluent Control		7.50	7.50	7.50	0.00	0.00	1
3.1		7.30	7.30	7.30	0.00	0.00	1
6.3		7.20	7.20	7.20	0.00	0.00	1
12.5		7.10	7.10	7.10	0.00	0.00	1
25		7.00	7.00	7.00	0.00	0.00	1
50		7.10	7.10	7.10	0.00	0.00	1
100		8.80	8.80	8.80	0.00	0.00	1
Lab Control	DO, % sat	97.40	97.40	97.40	0.00	0.00	1
Diluent Control		95.20	95.20	95.20	0.00	0.00	1
3.1		95.80	95.80	95.80	0.00	0.00	1
6.3		96.10	96.10	96.10	0.00	0.00	1
12.5		95.90	95.90	95.90	0.00	0.00	1
25		96.10	96.10	96.10	0.00	0.00	1
50		96.20	96.20	96.20	0.00	0.00	1
100		98.00	98.00	98.00	0.00	0.00	1

Statistical Printouts for the Freshwater Shrimp Tests

Freshwater Shrimp Acute Toxicity Test-96 hr Survival

Start Date:	4/04/2013 14:00	Test ID:	PR1022/02	Sample ID:	RP3
End Date:	8/04/2013 14:00	Lab ID:	5929	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 123	Test Species:	MB-Macrobrachium bullatum

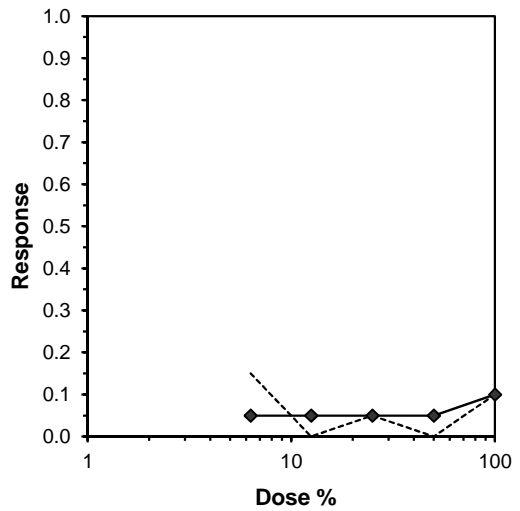
Conc-%	1	2	3	4
DMW Control	1.0000	1.0000	1.0000	1.0000
Dlluent Control	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	0.6000	0.8000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	0.8000
50	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	0.8000	0.8000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root				Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%			N	Mean
DMW Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			
Dlluent Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	*		1.0000 1.0000
6.3	0.8500	0.8500	1.1709	0.8861	1.3453	18.840	4	14.00	10.00	0.9500 0.9500
12.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0.9500 0.9500
25	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	0.9500 0.9500
50	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0.9500 0.9500
100	0.9000	0.9000	1.2262	1.1071	1.3453	11.212	4	14.00	10.00	0.9000 0.9000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.886449	0.916	-0.76869	1.684537
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1
Treatments vs Dlluent Control				

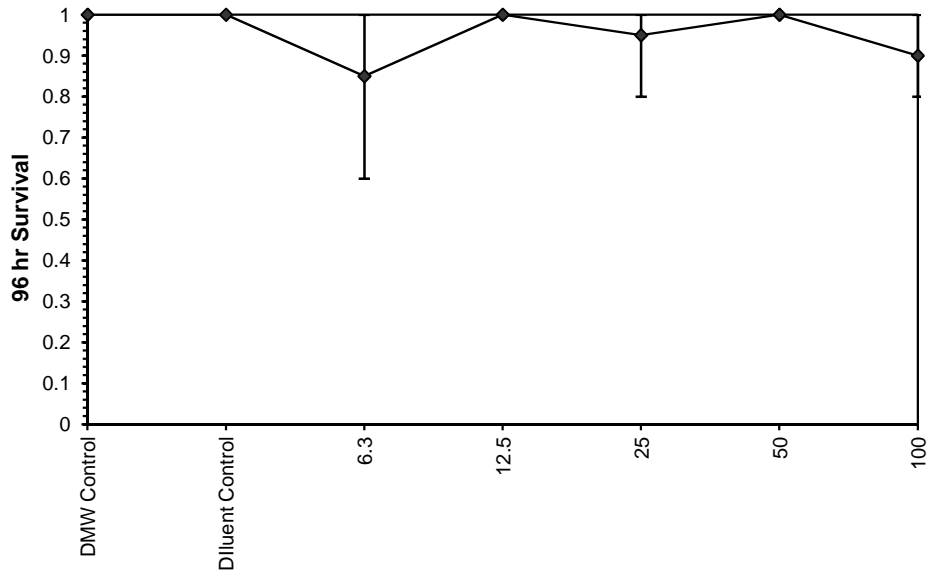
Log-Logit Interpolation (200 Resamples)				
Point	%	SD	95% CL(Exp)	Skew
IC05	50.000			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Freshwater Shrimp Acute Toxicity Test-96 hr Survival

Start Date: 4/04/2013 14:00 Test ID: PR1022/02 Sample ID: RP3
End Date: 8/04/2013 14:00 Lab ID: 5929 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 123 Test Species: MB-Macrobrachium bullatum
Comments:

Dose-Response Plot



Freshwater Shrimp Acute Toxicity Test-96 hr Survival

Start Date: 4/04/2013 14:00 Test ID: PR1022/02 Sample ID: RP3
 End Date: 8/04/2013 14:00 Lab ID: 5929 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 123 Test Species: MB-Macrobrachium bullatum
 Comments:

Auxiliary Data Summary

Conc-%	Parameter	Auxiliary Data Summary					
		Mean	Min	Max	SD	CV%	N
DMW Control	% Survival	100.00	100.00	100.00	0.00	0.00	4
Diluent Control		100.00	100.00	100.00	0.00	0.00	4
6.3		85.00	60.00	100.00	19.15	5.15	4
12.5		100.00	100.00	100.00	0.00	0.00	4
25		95.00	80.00	100.00	10.00	3.33	4
50		100.00	100.00	100.00	0.00	0.00	4
100		90.00	80.00	100.00	11.55	3.78	4
DMW Control	pH	8.20	8.20	8.20	0.00	0.00	1
Diluent Control		7.30	7.30	7.30	0.00	0.00	1
6.3		6.90	6.90	6.90	0.00	0.00	1
12.5		6.90	6.90	6.90	0.00	0.00	1
25		7.00	7.00	7.00	0.00	0.00	1
50		7.90	7.90	7.90	0.00	0.00	1
100		9.00	9.00	9.00	0.00	0.00	1
DMW Control	Cond uS/cm	169.70	169.70	169.70	0.00	0.00	1
Diluent Control		22.00	22.00	22.00	0.00	0.00	1
6.3		279.00	279.00	279.00	0.00	0.00	1
12.5		497.00	497.00	497.00	0.00	0.00	1
25		885.00	885.00	885.00	0.00	0.00	1
50		1555.00	1555.00	1555.00	0.00	0.00	1
100		2690.00	2690.00	2690.00	0.00	0.00	1
DMW Control	DO %	99.40	99.40	99.40	0.00	0.00	1
Diluent Control		95.10	95.10	95.10	0.00	0.00	1
6.3		97.10	97.10	97.10	0.00	0.00	1
12.5		99.30	99.30	99.30	0.00	0.00	1
25		98.70	98.70	98.70	0.00	0.00	1
50		100.90	100.90	100.90	0.00	0.00	1
100		113.90	113.90	113.90	0.00	0.00	1

Appendix B – Chemistry Reports

Reference	Description	Sample Description	Sample No.	Replicate	Date Sampled	Type of sample	Date prepared	Date analysed
Units							-	-
PQL								
Method								
87792	Mount Todd - SW2 & RP3 Treated Ecotox March 2	SW2	1	0	13/03/2013	Water	22/03/2013	22/03/2013
87792	Mount Todd - SW2 & RP3 Treated Ecotox March 2	SW2	1	1	13/03/2013	Water		
87792	Mount Todd - SW2 & RP3 Treated Ecotox March 2	RP3 treated	2	0	13/03/2013	Water	22/03/2013	22/03/2013

Reference	Total Suspended Solids @ 103-105°C	Total Dissolved Solids (grav)	Total Solids	Total Cyanide	Dissolved Organic Carbon	Total Organic Carbon	Nitrate as N in water
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
PQL	5	5	5	0.004	1	1	0.005
Method	Inorg-019	Inorg-018	Inorg-041	Inorg-013	Inorg-079	Inorg-079	Inorg-055
87792	<5	31	31	<0.004	2	2	<0.005
87792							
87792	<5	1600	1600	<0.004	<1	<1	2.8

Reference	Phosphate as P in water	Date prepared	Date analysed	Aluminium-(0.45µm filtered)	Cadmium-(0.45µm filtered)	Cobalt-(0.45µm filtered)
Units	mg/L	-	-	µg/L	µg/L	µg/L
PQL	0.005			10	0.1	1
Method	Inorg-060			Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-022 ICP-MS
87792	<0.005	22/03/2013	22/03/2013	29	<0.1	<1
87792						
87792	<0.005	22/03/2013	22/03/2013	<10	5.5	110

Reference	Chromium-(0.45µm filtered)	Copper-(0.45µm filtered)	Iron-(0.45µm filtered)	Lead-(0.45µm filtered)	Manganese-(0.45µm filtered)
Units	µg/L	µg/L	µg/L	µg/L	µg/L
PQL	1	1	10	1	5
Method	Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-022 ICP-MS
87792	<1	<1	270	<1	<5
87792					
87792	1	<1	<10	<1	2200

Reference	Mercury-(0.45µm filtered)	Nickel-(0.45µm filtered)	Zinc-(0.45µm filtered)	Date prepared	Date analysed	Aluminium-Total	Cadmium-Total
Units	µg/L	µg/L	µg/L	-	-	µg/L	µg/L
PQL	0.05	1	1			10	0.1
Method	Metals-021 CV-AAS	Metals-022 ICP-MS	Metals-022 ICP-MS			Metals-022 ICP-MS	Metals-022 ICP-MS
87792	<0.05	<1	1	22/03/2013	22/03/2013	290	<0.1
87792						290	<0.1
87792	<0.05	130	82	22/03/2013	22/03/2013	<10	8.5

Reference	Cobalt-Total	Chromium-Total	Copper-Total	Iron-Total	Lead-Total	Manganese-Total	Mercury-Total
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
PQL	1	1	1	10	1	5	0.05
Method	Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-021 CV-AAS
87792	<1	<1	<1	740	<1	<5	<0.05
87792	<1	<1	<1	760	<1	<5	[NT]
87792	120	1	<1	<10	<1	2300	<0.05

Reference	Nickel-Total	Zinc-Total	Magnesium - Total	Date prepared	Date analysed	Calcium - (0.45µm filtered)	Potassium - Dissolved
Units	µg/L	µg/L	mg/L	-	-	mg/L	mg/L
PQL	1	1	0.5			0.5	0.5
Method	Metals-022 ICP-MS	Metals-022 ICP-MS	Metals-020 ICP-AES			Metals-020 ICP-AES	Metals-020 ICP-AES
87792	<1	2	0.8	22/03/2013	22/03/2013	0.5	<0.5
87792	<1	3					
87792	140	540	110	22/03/2013	22/03/2013	490	8

Reference	Sodium - Dissolved	Magnesium - (0.45µm filtered)	Hydroxide Alkalinity (OH ⁻)	Bicarbonate Alkalinity as	Carbonate Alkalinity as	Total Alkalinity
			as CaCO ₃	CaCO ₃	CaCO ₃	as CaCO ₃
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
PQL	0.5	0.5	5	5	5	5
Method	Metals-020 ICP-AES	Metals-020 ICP-AES	Inorg-006	Inorg-006	Inorg-006	Inorg-006
87792	1.7	0.8	<5	17	<5	17
87792						
87792	51	110	<5	45	6	51

Reference	Sulphate, SO4	Chloride, Cl	Ionic Balance	Hardness
Units	mg/L	mg/L	%	mgCaCO ₃ /L
PQL	1	1		3
Method	Inorg-081	Inorg-081	Inorg-041	
87792	<1	1	-40	4
87792				
87792	1600	7	2.1	1700

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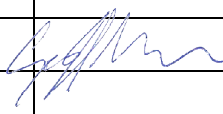
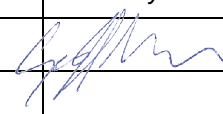
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