

**DATE** May 23, 2012**PROJECT No.** 11-1365-0012/DCN-076**TO** Veronica Chisholm  
De Beers Canada Inc.**CC** Stephen Lines, De Beers Canada Inc.; John Faithful, Golder Associates Ltd.**FROM** Ekram Azim, Bart Blais, Golder Associates Ltd.

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**GROUNDWATER CHEMISTRY DATA BOX AND WHISKER PLOTS AND PIPER PLOTS IN RESPONSE TO JOINT INFORMATION REQUEST FROM FISHERIES AND OCEANS CANADA AND ENVIRONMENT CANADA (DFO&EC\_6) AND YELLOWKNIVES DENE FIRST NATION (YKDFN\_2.24)**

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**1.0 INTRODUCTION**

This technical memorandum has been developed in response to joint information request from Fisheries and Oceans Canada and Environment Canada, DFO&EC\_6 and Yellowknives Dene First Nation YKDFN\_2.24 (De Beers 2012a,b).

Groundwater chemistry data for Kennady Lake are presented in Annex G and briefly discussed in Section 11.6 of the 2010 EIS (De Beers 2010) and Section 8.3.4.3 of the 2011 EIS Update (De Beers 2011). As requested, available groundwater data from Annex G have been compiled and summarized. The data used in the summary table and figures presented below represent 48 samples collected in 2004, 2005 and 2011 from eight different wells located within the Kennady Lake watershed. Summary details of the monitoring wells are provided in Appendix A, Table A-1 (see Figure G3.1-1 of Annex G for the locations of these bores).

The groundwater summary data presented herein characterize the deep groundwater system (i.e., below the permafrost and within through-taliks) according to two depth zones: Depth 1 = <200 metres (m), and Depth 2 = >200 m. These depth zones were selected based on higher average permeability values identified for the depth zone to 200 m, which was calculated from permeability testing of the hydrostratigraphic units below ground level. The deep groundwater system above 200 m therefore has greater potential to be influenced by meteoric water (De Beers 2010, Section 11.6.2.2.3, Table 11.6-2).

Groundwater chemistry constituents were grouped into four categories: conventional parameters, major ions, nutrients and trace metals. They are summarized for each depth zone (Appendix A, Table A-2 and Appendix B, Figures B-1 to B-54). The distribution of major ions is also presented in Piper plots for each groundwater depth zone (Appendix B, Figure B-55). A brief description of the deep groundwater chemistry is provided below.

On-going monitoring of groundwater bores will supplement this dataset.



## 1.1 Data Management

Tabulated groundwater chemistry data include reference to values measured below the method detection limits (MDLs); there are instances where MDLs varied over the monitoring period. As a result MDLs may be represented as minimum and maximum values. Median values for any given constituent were calculated depending on the proportion of samples measured below the MDL for that constituent. For example:

- if 33 percent of the measured data for a constituent were less than MDL, the results below MDL were halved for the calculation of the median;
- if 33 to 66 percent of the measured data for a constituent were below MDL, only the results above MDL were used to calculate the median; and
- if greater than 66 percent of the measured data for a constituent were less than MDL, the median was not calculated.

## 1.2 Conventional Parameters

The summary of conventional groundwater chemistry is presented in Appendix A, Table A-2 and trends between the two groundwater depth zones in Appendix B, Figures B-1 to B-10. Specific conductivity, total hardness, and total dissolved solid (TDS) concentrations were higher in the deeper groundwater depth zone (Appendix A, Table A-2 and Appendix B, Figure B-2 for specific conductivity, Figure B-3 for total hardness, and Figures B-6 to B-8 for TDS). This trend is generally consistent with that observed in groundwater at other sites in the Canadian Shield (Kuchling et al. 2000; Fritz and Frapre 1987). Total alkalinity values were lower in the deeper zone (Appendix A, Table A-2 and Appendix B, Figure B-7). No trends were apparent for pH and TSS.

## 1.3 Major Ions

The summary of major ions data is presented in Appendix A, Table A-2 and depth-specific trends in Appendix B, Figures B-11 to B-18. Of the 11 major ions measured, higher median concentrations of calcium, chloride, magnesium, sodium and sulphate were measured at the deeper groundwater zone. The similar trend to TDS reflected the substantial contribution of these ions to TDS. Median concentrations of bicarbonate and potassium were lower in the deeper groundwater zone. Insufficient data were available for bromide, carbonate and hydroxide to identify any trends.

A piper plot presenting the major anions and cations is shown in Appendix B, Figure B-55. The dominant major ions were calcium, sodium, and chloride, under buffered alkaline conditions.

## 1.4 Nutrients

The summary of nutrients data is presented in Appendix A, Table A-2 and depth-specific trends in Appendix B, Figures B-19 to B-25. Boxplots of nutrient data were limited to ammonia, total phosphorus and orthophosphate, and inorganic and organic carbon as measured data for other nutrients were typically below MDL values (Appendix A, Table A-2). Median concentrations of total ammonia (Appendix B, Figure B-19), and total and dissolved inorganic carbon concentrations, were lower in the deeper groundwater zone (Appendix B, Figure B-22 to B-23). The range of total phosphorus was similar in both groundwater zones, with a range of total and dissolved organic carbon, measured in the deeper groundwater zone.

## 1.5 Trace Metals

The total and dissolved metals suite included 23 constituents (Appendix A, Table A-2). Boxplots for metals that had results greater than 50% above the MDL have been presented (Appendix B, Figures B-26 to B-54); plots for dissolved chromium, cobalt, lead, selenium and vanadium were not presented because of the high percentage of results below MDLs. A higher proportion of the metals data comprise dissolved metals concentrations because the 2011 sampling program was limited to dissolved metals; samples for metals analyses in the 2004 and 2005 programs included both total and dissolved metals.

For most of the total metals, the range and median concentrations were similar between the two groundwater depth zones. Total barium, silicon and uranium had lower concentrations in the deeper zone, and total boron and nickel concentrations were higher in the deeper zone. The dissolved metals showed similar trends to their respective total metals between the two depth zones.

## 2.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

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### 3.0 REFERENCES

- De Beers (De Beers Canada Inc.). 2010. *Environmental Impact Statement for the Gahcho Kué Project*. Submitted to the Mackenzie Valley Environmental Impact Review Board, December 2010.
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- Kuchling, K., D. Chorley and W. Zawadzki. 2000. *Hydrogeological modelling of mining operations at the Diavik Diamonds Project*. In Proceedings of the Sixth International Symposium on Environmental Issues and Waste Management in Energy and Mineral Production, University of Calgary, Calgary AB.

# APPENDIX A

## Groundwater Quality Data for Monitoring Wells and Summary Statistics of Boreholes within the Kennady Lake Watershed

**Table A-1 Details of Monitoring Wells for Groundwater Quality Data**

Well Site	Well Sample	Sample Date	Zone	Port Depth [m] <sup>(a)</sup>	Depth of Zone Bottom[m] <sup>(a)</sup>	Well Installation Method
144C	MPV04-144C	15-May-04	-	106	182	-
202C	MPV04-202C	15-May-04	-	320	380	-
	MPV04-234C	21-Aug-04	-	28	54	-
234C	MPV04-234C	29-Aug-04	-	288	311	-
	MPV04-234C	29-Aug-04	-	93	119	-
	MPV04-234C	29-Aug-04	-	183	210	-
235C	MPV05-235C	8-Jan-05	-	56	85	AirLift
	MPV05-236C	15-Dec-05	1	431	461	Westbay
	MPV05-236C	15-Dec-05	2	381	430	Westbay
	MPV05-236C	15-Dec-05	3	346	380	Westbay
	MPV05-236C	31-Aug-05	4	336	345	Westbay
	MPV05-236C	15-Dec-05	4	335	344	Westbay
236C	MPV05-236C	15-Dec-05	5	287	334	Westbay
	MPV05-236C	15-Dec-05	6	250	285	Westbay
	MPV05-236C	16-Sep-05	7	230	249	Westbay
	MPV05-236C	15-Dec-05	7	230	249	Westbay
	MPV05-236C	16-Sep-05	8	192	229	Westbay
	MPV11-236C	6-Mar-11	1	431	461	Westbay
	MPV11-236C	6-Mar-11	4	335	345	Westbay
	MPV11-236C	7-Mar-11	7	230	249	Westbay
	MPV05-238C	15-Dec-05	1	441	472	Westbay
	MPV05-238C	16-Sep-05	4	323	350	Westbay
	MPV05-238C	15-Dec-05	4	322	350	Westbay
	MPV05-238C	15-Dec-05	6	231	260	Westbay
	MPV05-238C	17-Sep-05	6	231	260	Westbay
	MPV05-238C	17-Sep-05	8	167	201	Westbay
238C	MPV05-238C	17-Sep-05	11	62	89	Westbay
	MPV05-238C	8-Aug-05	-	321	353	AirLift
	MPV05-238C	16-Sep-05	-	172	203	AirLift
	MPV05-238C	10-Sep-05	4	323	350	Westbay
	MPV11-238C	2-Mar-11	1	442	473	Westbay
	MPV11-238C	3-Mar-11	4	323	350	Westbay
	MPV11-238C	3-Mar-11	6	231	260	Westbay
	MPV11-238C	4-Mar-11	8	167	201	Westbay
	MPV05-239C	-	2	347	368	Westbay
	MPV05-239C	-	3	318	345	Westbay
	MPV05-239C	10-Sep-05	1	370	396	Airlift
MPV05-239C	6-Sep-05	4	295	317	Airlift	

**Table A-1 Details of Monitoring Wells for Groundwater Quality Data (continued)**

239C	MPV11-239C	9-Mar-11	1	370	397	Westbay
	MPV11-239C	1-Mar-11	2	348	369	Westbay
	MPV11-239C	1-Mar-11	3	319	346	Westbay
	MPV11-239C	9-Mar-11	7	233	248	Westbay
	MPV11-239C	9-Mar-11	8	184	232	Westbay
	MPV11-239C	10-Mar-11	11	96	131	Westbay
	MPV05-240C	-	5	217	252	Westbay
240C	MPV05-240C	-	7	173	201	Westbay
	MPV05-240C	-	7	173	201	Westbay
	MPV05-240C	4-Sep-05	7	173	201	Airlift

<sup>(a)</sup> port depth and depth of zone bottom presented as distance corrected for hole angle.

- information was not available.



**Table A-2 Summary Statistics of Groundwater Quality Data in Developed Boreholes within the Kennady Lake Watershed by Depth**

Parameter	Units	<200 metres					>200 metres				
		n	Min	Median	Max	% Below MDL	n	Min	Median	Max	% Below MDL
<b>Conventional Parameters</b>											
pH (25 °C)	--	11	7.11	7.52	7.97	0%	24	6.33	7.63	7.95	0%
pH	-	2	7.6	-	8.8	0%	10	6.79	7.60	9.89	0%
Specific conductivity	mS/cm	14	0.460	3.43	8.240	0%	34	0.514	6.65	21.0	0%
Total hardness	mg CaCO <sub>3</sub> /L	10	180	1,550	3,150	0%	14	189	3,290	7,570	0%
Total Alkalinity	mg CaCO <sub>3</sub> /L	14	36	66	113	0%	34	<5	51	145	3%
True Colour	TCU	6	<1	5	10	17%	12	<1	5	20	25%
Total dissolved solids, calculated	mg/L	3	409	541	3,710	0%	10	857	6,410	12,900	0%
Total dissolved solids (105°C)	mg/L	9	376	2,900	5,880	0%	14	424	6,280	16,400	0%
Total dissolved solids (180 °C)	mg/L	7	320	3,310	5,530	0%	22	376	2,935	14,700	0%
Total suspended solids	mg/L	5	4	12	38	0%	10	2	13	55	0%
Turbidity	NTU	11	4	11	64	0%	21	4	8	89	0%
<b>Major Ions</b>											
Bicarbonate	mg/L	10	53	82	137	0%	14	14	56	124	0%
Bromide	mg/L	0	-	-	-	-	1	8.3	-	8.3	0%
Calcium	mg/L	14	54.1	408	958	0%	34	55.4	1,026	2,620	0%
Carbonate	mg/L	10	<1	-	<1	100%	14	<1	-	<1	100%
Chloride	mg/L	14	93.1	1,070	2,760	0%	34	108	2,735	7,590	0%
Fluoride	mg/L	13	0.125	0.4	0.8	31%	24	0.3	0.6	1.49	8%
Hydroxide	mg/L	10	<1	-	<1	100%	14	<1	-	<1	100%
Magnesium	mg/L	14	0.6	56	185	0%	34	0.95	93	378	0%
Potassium	mg/L	14	3.5	15	94.7	0%	34	2.6	8.0	31.5	0%
Sodium	mg/L	14	7	250	502	0%	34	13.6	594	1,890	0%
Sulphate	mg/L	14	0.385	66.3	738	14%	34	21.3	197	1,130	0%
<b>Nutrients</b>											
Nitrate	mg N/L	13	<0.006	-	0.11	85%	24	<0.006	0.025	1.64	67%

**Table A-2 Summary Statistics of Groundwater Quality Data in Developed Boreholes within the Kennady Lake Watershed by Depth (continued)**

Parameter	Units	<200 metres					>200 metres				
		n	Min	Median	Max	% Below MDL	n	Min	Median	Max	% Below MDL
Nitrite	mg N/L	13	<0.002	-	<5	100%	24	<0.002	-	<5	83%
Total ammonia	mg N/L	10	0.3	0.85	2.2	10%	13	0.1	0.4	1.2	8%
Total Kjeldahl nitrogen	mg N/L	3	<0.4	0.2	<0.4	33%	1	1.2	1.2	1.2	0%
Total phosphorus	mg P/L	9	<0.02	0.04	0.221	56%	21	0.0093	0.010	0.078	52%
Total dissolved phosphorus	mg P/L	4	<0.02	-	0.02	75%	11	<0.02	-	<0.02	100%
Dissolved phosphorus	mg P/L	8	<0.005	-	<0.02	100%	11	<0.005	-	0.04	91%
Orthophosphate	mg P/L	3	<0.001	-	<0.001	100%	9	<0.001	0.002	0.054	44%
Total inorganic carbon	mg/L	6	7	17	22	0%	12	1	11	25	0%
Total organic carbon	mg/L	6	2	3	7	0%	12	<1	3	24	17%
Dissolved inorganic carbon	mg/L	3	2	17	22	0%	11	1	10	25	0%
Dissolved organic carbon	mg/L	8	<0.02	3.5	6	13%	12	<1	3	24	17%
<b>Total Metals</b>											
Aluminum	µg/L	8	<20	24	2,060	38%	11	<5	22	291	36%
Antimony	µg/L	8	<0.1	-	<2	75%	11	<0.1	0.5	<2	64%
Arsenic	µg/L	8	<5	30	128	25%	11	<5	30	159	18%
Barium	µg/L	8	39	85	700	0%	11	<10	50	160	9%
Beryllium	µg/L	8	<0.5	-	<0.5	100%	11	<0.5	-	<1	100%
Boron	mg/L	8	<0.100	0.300	0.433	13%	11	0.027	0.273	1.18	0%
Cadmium	µg/L	8	<0.1	0.075	0.3	63%	11	<0.1	0.1	0.4	64%
Chromium	µg/L	8	<1	2.3	36	13%	11	<0.9	2	10	18%
Cobalt	µg/L	8	<0.1	1.1	2.8	50%	11	0.3	0.9	2.7	18%
Copper	µg/L	8	<2	3.7	10	13%	11	1.5	3.7	9.2	18%
Iron	mg/L	8	<0.01	2.09	7.18	13%	11	0.56	2.9	8.54	0%
Lead	µg/L	8	0.3	0.8	4	38%	11	0.3	0.8	5	18%
Manganese	µg/L	8	75	150	<470	38%	11	100	157	226	9%
Mercury	µg/L	8	<0.1	-	<10	100%	11	<0.1	-	<10	100%
Molybdenum	µg/L	8	<1	6.45	13	25%	11	1	5	37.6	9%
Nickel	µg/L	8	<2	3.9	69.2	13%	11	<2	20.3	61.3	18%

**Table A-2 Summary Statistics of Groundwater Quality Data in Developed Boreholes within the Kennady Lake Watershed by Depth (continued)**

Parameter	Units	<200 metres					>200 metres				
		n	Min	Median	Max	% Below MDL	n	Min	Median	Max	% Below MDL
Selenium	µg/L	8	<0.8	14	229	38%	11	<0.8	11	223	9%
Silicon	mg/L	8	2.6	5.0	7.5	0%	11	0.68	3.8	6.0	0%
Silver	µg/L	8	<0.2	-	3.4	88%	11	<0.2	-	<0.5	100%
Thallium	µg/L	8	<0.05	-	<2	88%	11	<0.05	-	<2	91%
Uranium	µg/L	8	0.5	5	<10	38%	11	0.31	1.3	34.7	18%
Vanadium	µg/L	8	0.3	0.5	<1	50%	11	<0.1	0.5	1.2	55%
Zinc	µg/L	8	6	21	152	13%	11	13	45	99	18%
<b>Dissolved Metals</b>											
Aluminum	µg/L	11	3	10	150	36%	20	<2	8	56	35%
Antimony	µg/L	11	<0.03	-	<2	91%	20	<0.1	-	<2	90%
Arsenic	µg/L	11	0.13	2.5	53.7	27%	20	<0.15	2.5	127	50%
Barium	µg/L	11	34	118	410	0%	20	12	51	269	0%
Beryllium	µg/L	11	<0.1	-	<2	100%	20	<0.1	-	<4	100%
Boron	mg/L	11	0.037	0.205	5.03	9%	20	0.027	0.42	3.72	0%
Cadmium	µg/L	11	<0.05	-	<0.5	82%	20	<0.05	-	<1	70%
Chromium	µg/L	11	0.13	0.5	48	45%	20	<0.3	0.5	2.2	70%
Cobalt	µg/L	11	<0.05	0.5	2.07	64%	20	0.07	0.6	2.21	55%
Copper	µg/L	11	0.6	2.8	8.2	36%	20	1.3	2.5	<12	55%
Iron	mg/L	11	<0.010	1.21	5.73	36%	20	<0.010	0.609	5.03	20%
Lead	µg/L	11	<0.05	-	<2	73%	20	<0.05	-	2	80%
Manganese	µg/L	11	23.4	143	<418	27%	20	<1	162	298	10%
Mercury	µg/L	11	<0.02	-	<10	100%	20	<0.02	-	<10	100%
Molybdenum	µg/L	11	<1	8	42.2	18%	20	<0.3	4	37	20%
Nickel	µg/L	11	0.57	3	37.7	9%	20	<0.1	3	44.3	35%
Selenium	µg/L	11	<0.4	1.9	111	64%	20	<0.4	0.2	137	65%
Silicon	mg/L	8	2.3	3.9	7.0	0%	11	0.38	3.9	5.1	0%
Silver	µg/L	11	<0.05	-	<1	100%	20	<0.05	-	<2	100%
Thallium	µg/L	8	<0.02	-	<2	88%	11	<0.02	-	<2	100%

**Table A-2 Summary Statistics of Groundwater Quality Data in Developed Boreholes within the Kennady Lake Watershed by Depth (continued)**

Parameter	Units	<200 metres					>200 metres				
		n	Min	Median	Max	% Below MDL	n	Min	Median	Max	% Below MDL
Uranium	µg/L	11	<0.25	5	<10	55%	20	0.17	0.7	31.5	35%
Vanadium	µg/L	11	<0.25	-	<10	82%	20	<0.25	-	2.37	75%
Zinc	µg/L	11	<2	12.5	142	27%	20	<4	9	55	35%

**Note:** MDL= method detection limit; - = not available; mg/L = milligrams per litre; TCU = true colour unit; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity unit; mg CaCO<sub>3</sub>/L = milligrams per litre as calcium carbonate; mg N/L = milligrams per litre as nitrogen; mg P/L = milligrams per litre as phosphorus; µg/L = micrograms per litre.

< = less than; > = greater than; % = percent, n = number of samples; Min = minimum; Max = maximum.

When calculating the median:

If, “% Less Than MDL”, was less than 33% the results below detection were halved.

If, “% Less Than MDL”, was greater than 33% but less than 66% the results below detection were not used.

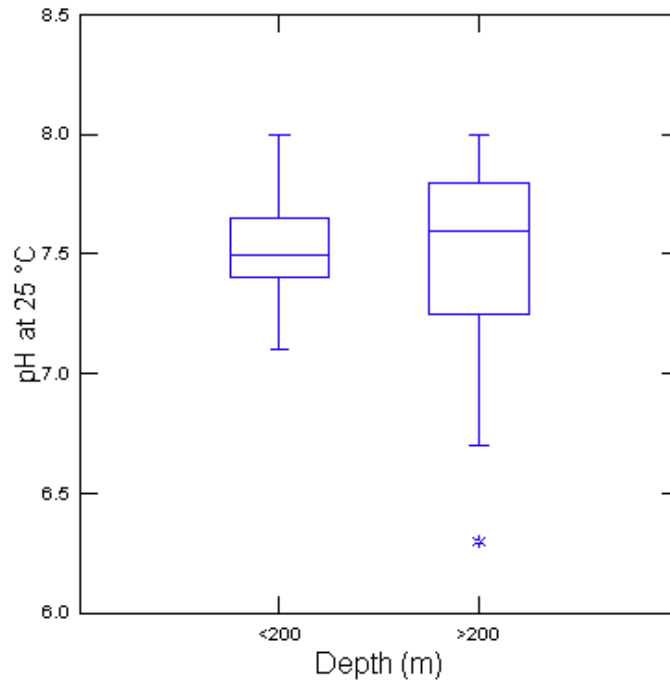
If, “% Less Than MDL”, was greater than 66% the median was not calculated.

# APPENDIX B

## Groundwater Chemistry Data Box and Whisker Plots and Piper Plots

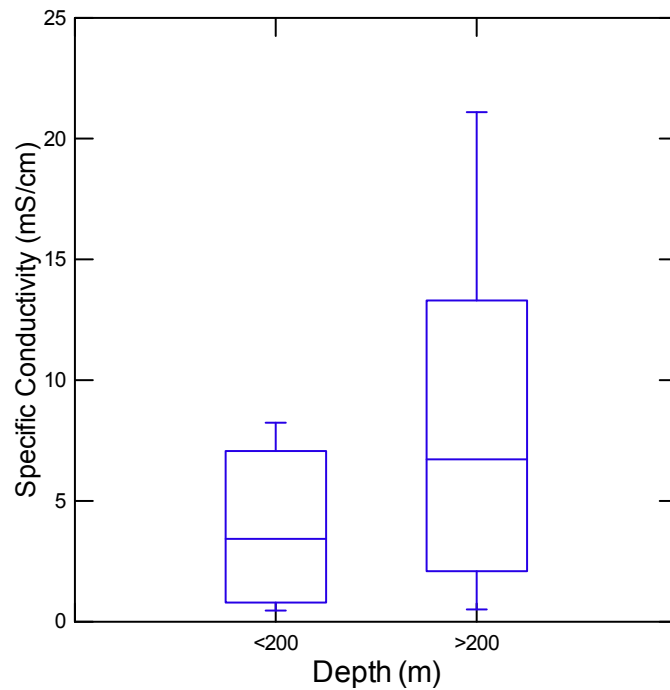
### Conventional Parameters

**Figure B-1 Summary pH (25°C) for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



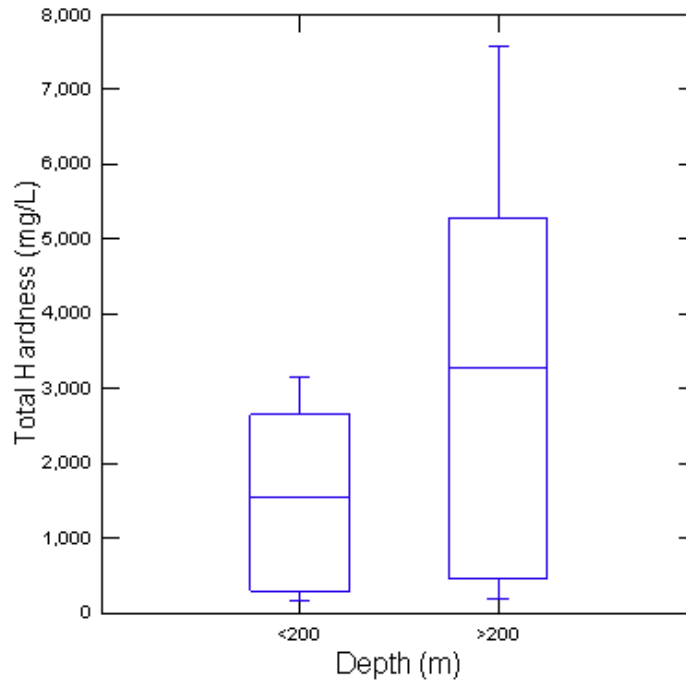
**Note:** °C = degrees Celsius; m = meter.  
Sample count per site: <200 = 11; >200 = 24.

**Figure B-2 Summary Specific Conductivity for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



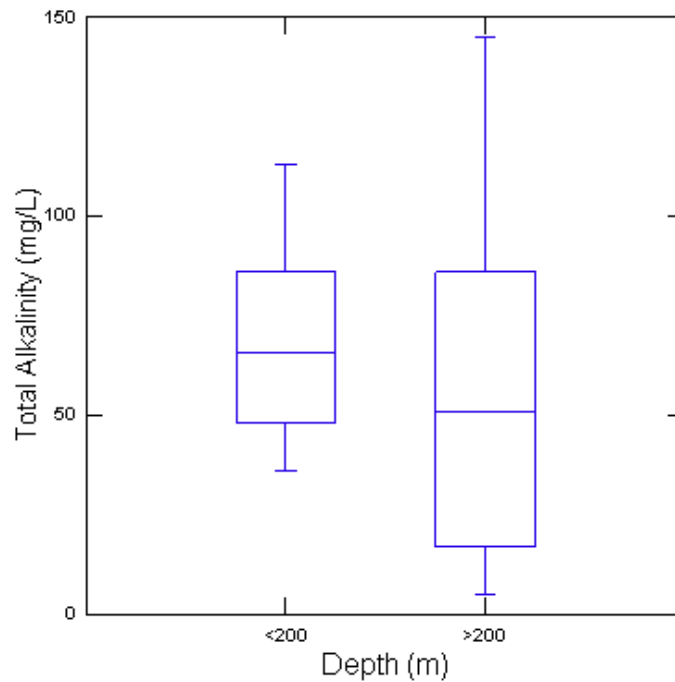
**Note:** mS/cm = milliSiemens per centimetre; m = metre.  
Sample count per site: <200 = 14; >200 = 34.

**Figure B-3 Summary Total Hardness for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



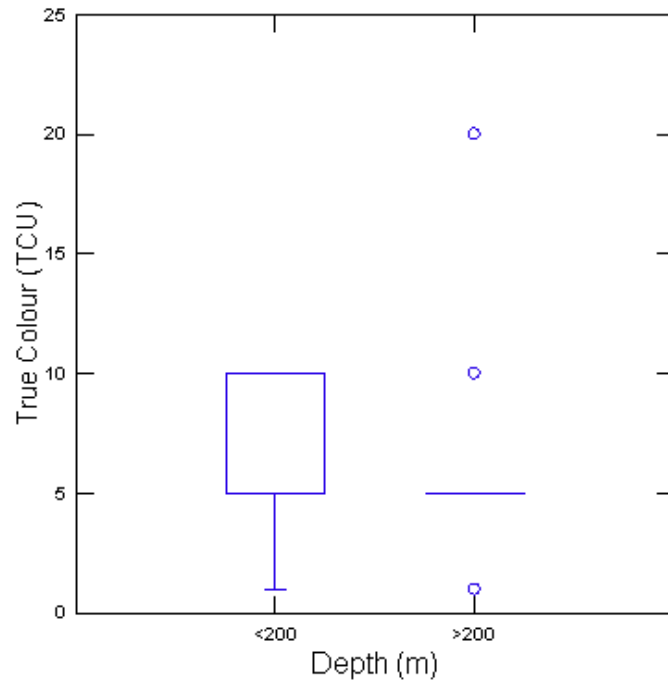
**Note:** Total hardness calculated as calcium carbonate in milligrams per litre  
mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 10; >200 = 14.

**Figure B-4 Summary Total Alkalinity for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



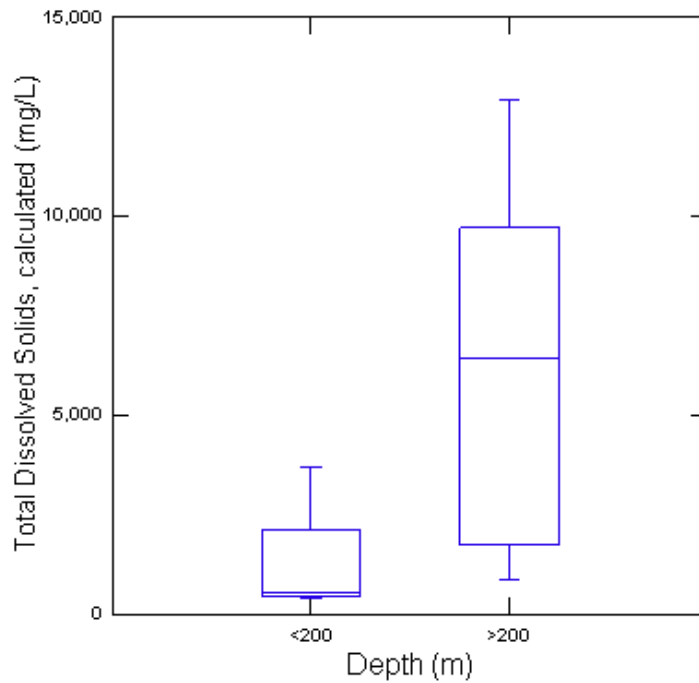
**Note:** Total alkalinity calculated as calcium carbonate in milligrams per litre  
mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 14; >200 = 34.

**Figure B-5 Summary True Colour for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



**Note:** TCU = true colour unit; m = metre.  
Sample count per site: <200 = 6; >200 = 12.

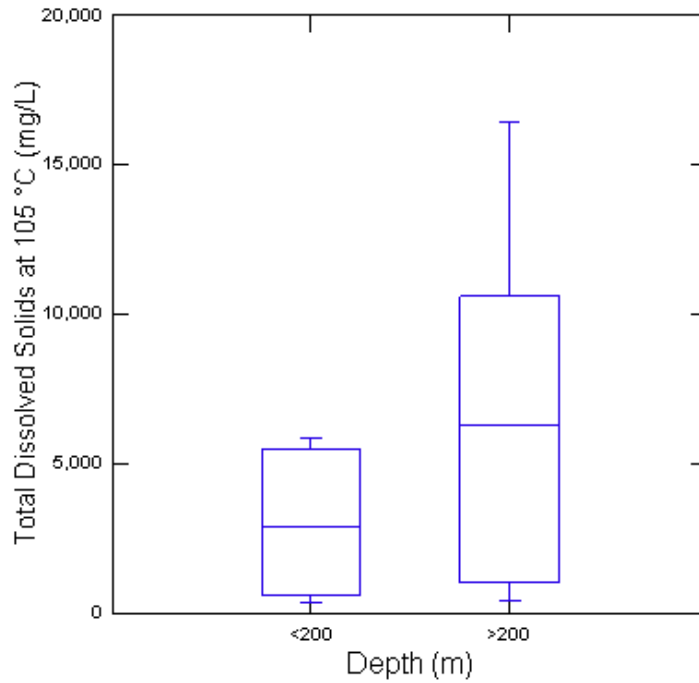
**Figure B-6 Summary Total Dissolved Solids (Calculated) Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 3; >200 = 10.

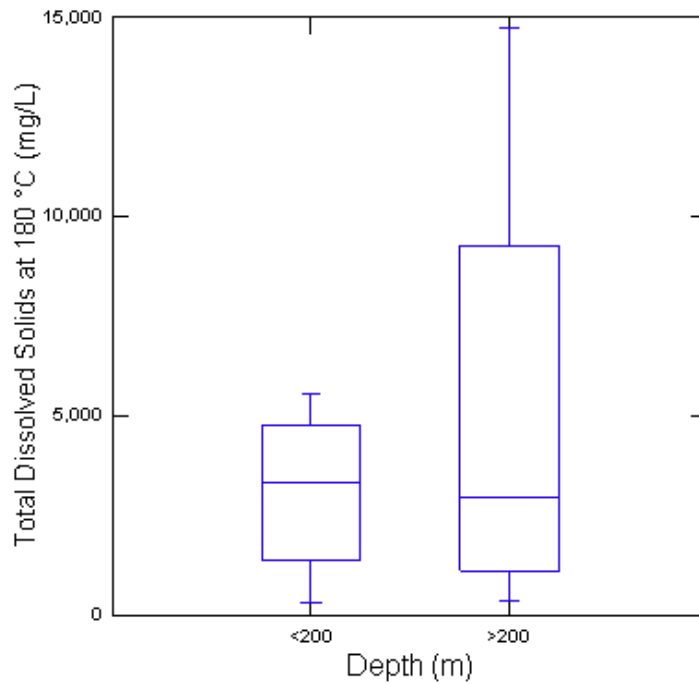


**Figure B-7 Summary Total Dissolved Solids (105°C) Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



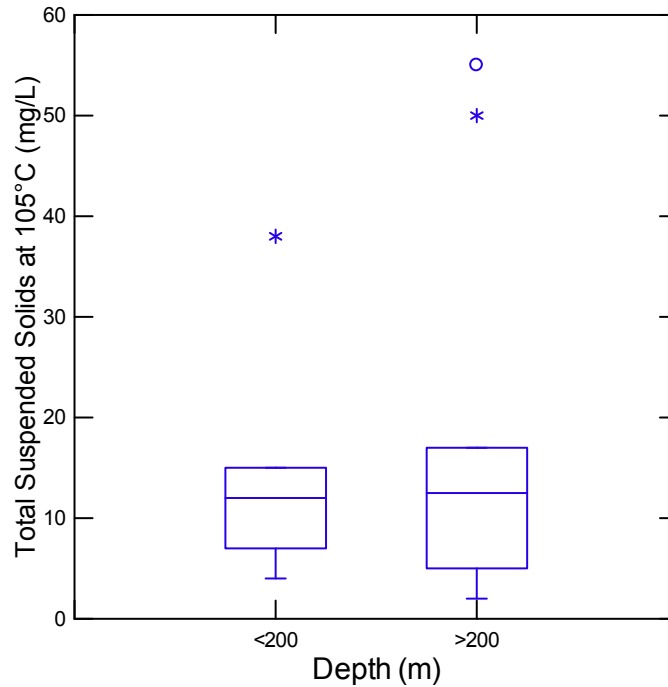
**Note:** mg/L = milligrams per litre; °C = degrees Celsius; m = metre.  
Sample count per site: <200 = 9; >200 = 14.

**Figure B-8 Summary Total Dissolved Solids (180°C) Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



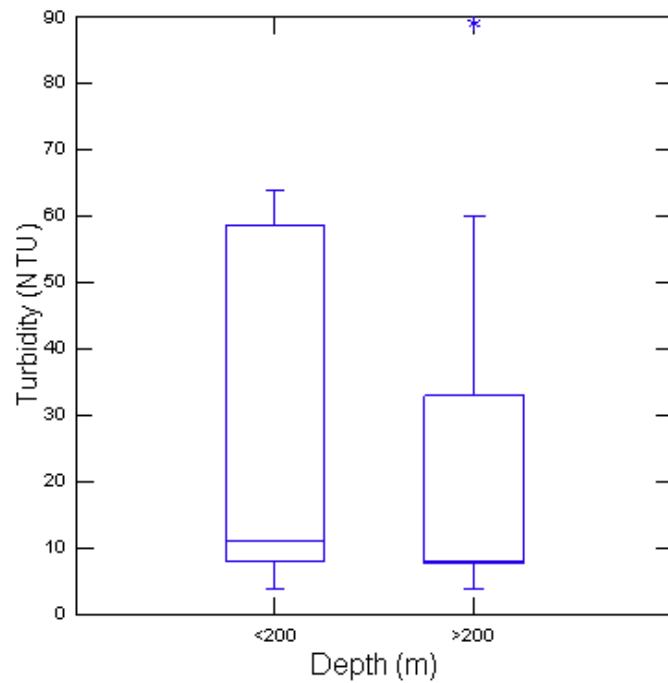
**Note:** mg/L = milligrams per litre; °C = degrees Celsius; m = metre.  
Sample count per site: <200 = 7; >200 = 22.

**Figure B-9 Summary Total Suspended Solids (105°C) Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



**Note:** mg/L = milligrams per litre; °C = degrees Celsius; m = metre.  
Sample count per site: <200 = 5; >200 = 10.

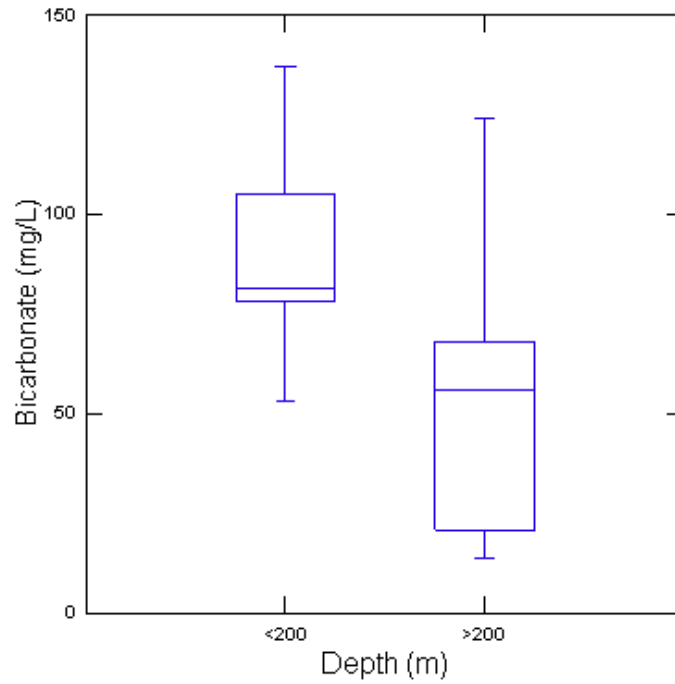
**Figure B-10 Summary Turbidity for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



**Note:** NTU = nephelometric turbidity unit; m = metre.  
Sample count per site: <200 = 11; >200 = 21.

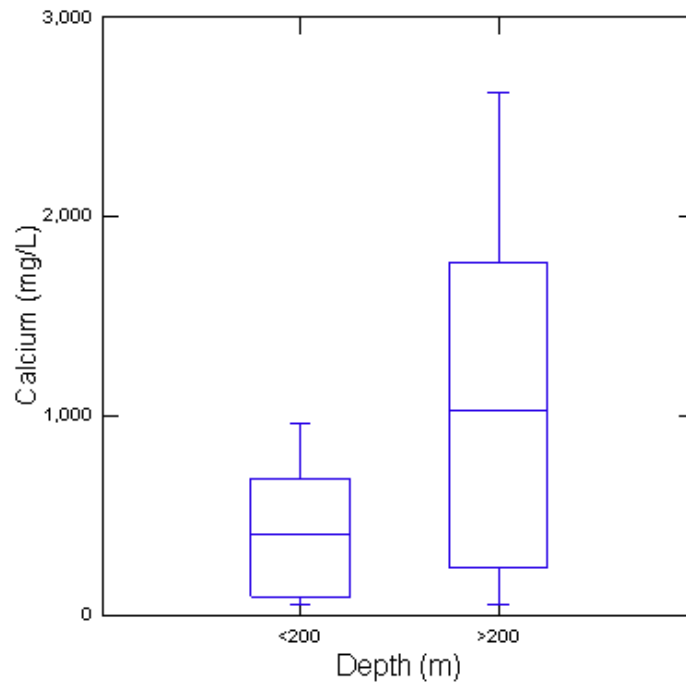
### Major Ions

**Figure B-11 Summary Bicarbonate Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



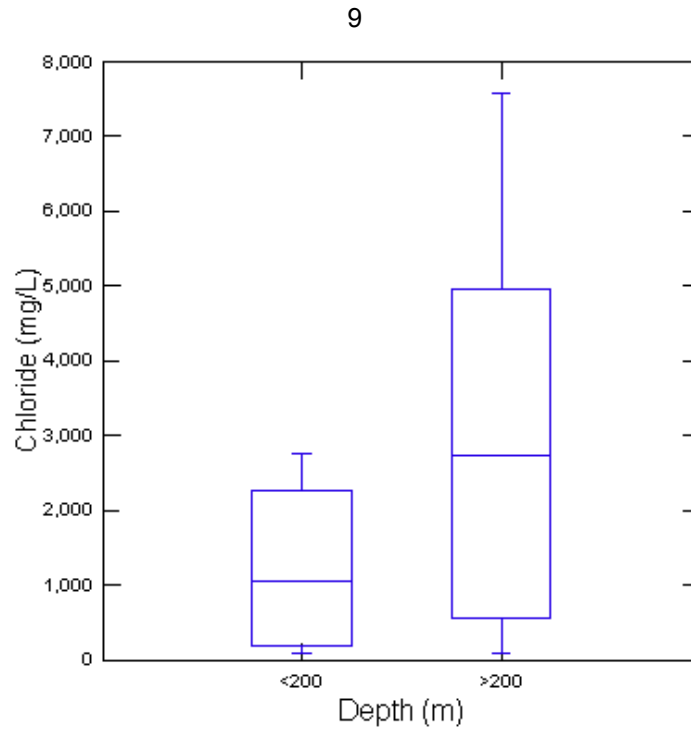
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 10; >200 = 14.

**Figure B-12 Summary Calcium Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



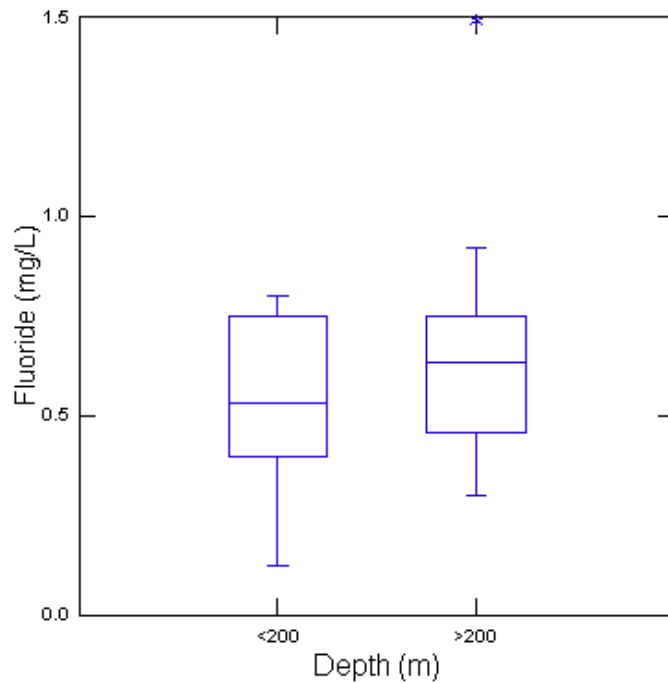
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 14; >200 = 34.

**Figure B-13 Summary Chloride Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



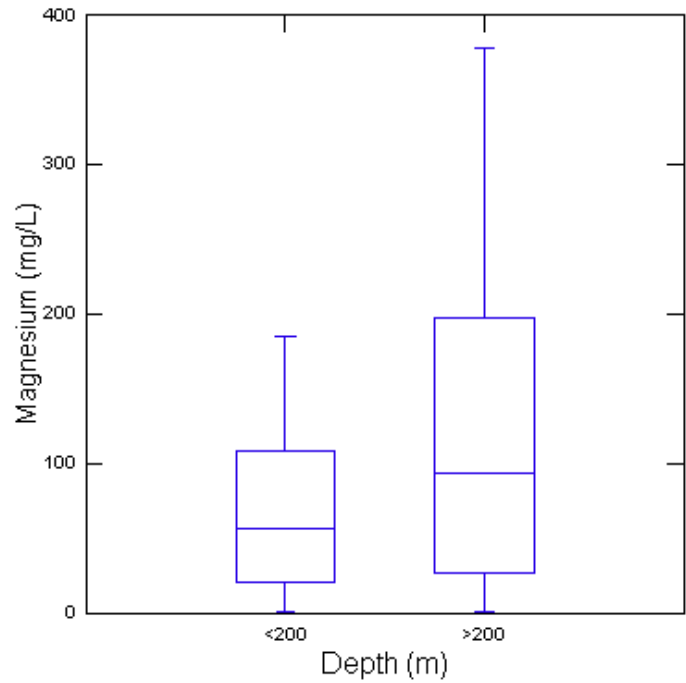
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 14; >200 = 34.

**Figure B-14 Summary Fluoride Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



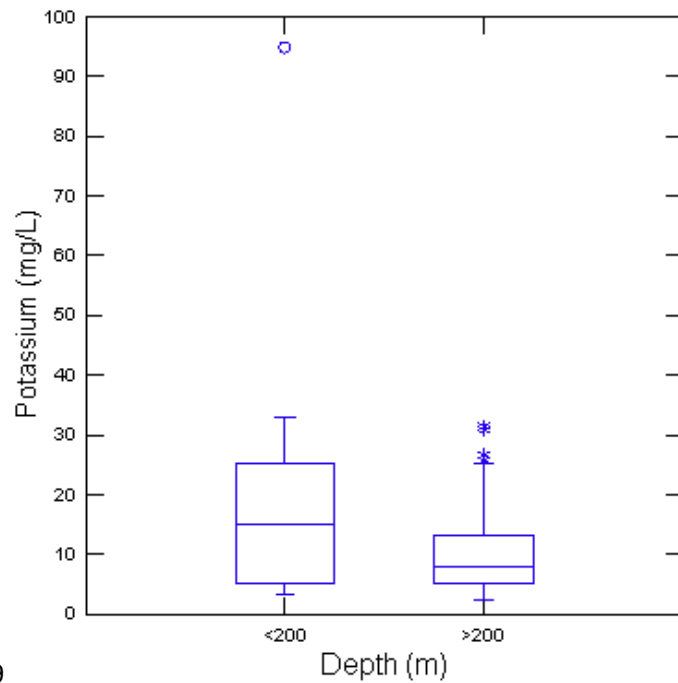
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 13; >200 = 24.

**Figure B-15 Summary Magnesium Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 14; >200 = 34.

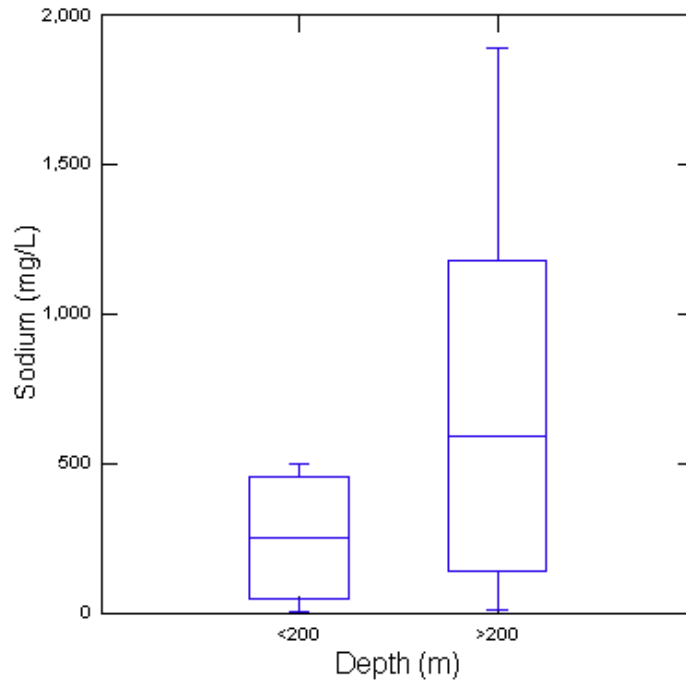
**Figure B-16 Summary Potassium Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 14; >200 = 34.

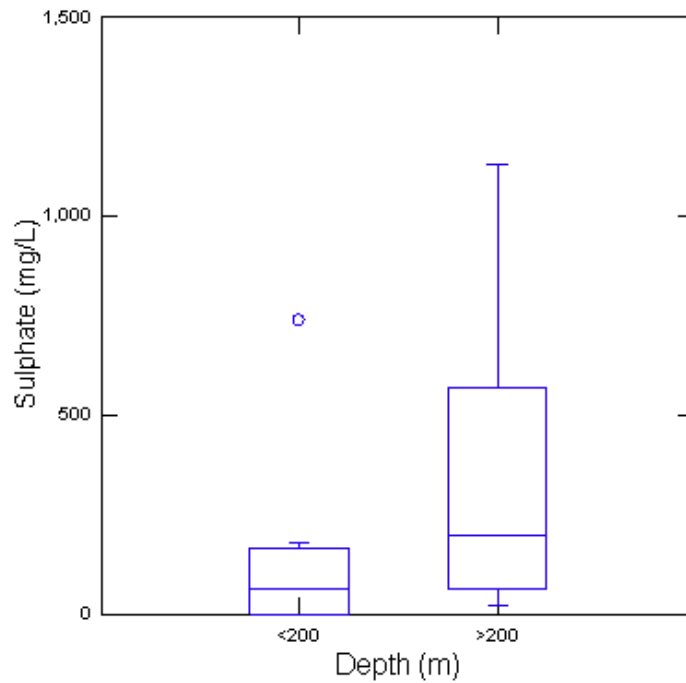
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**Figure B-17 Summary Sodium Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 14; >200 = 34.

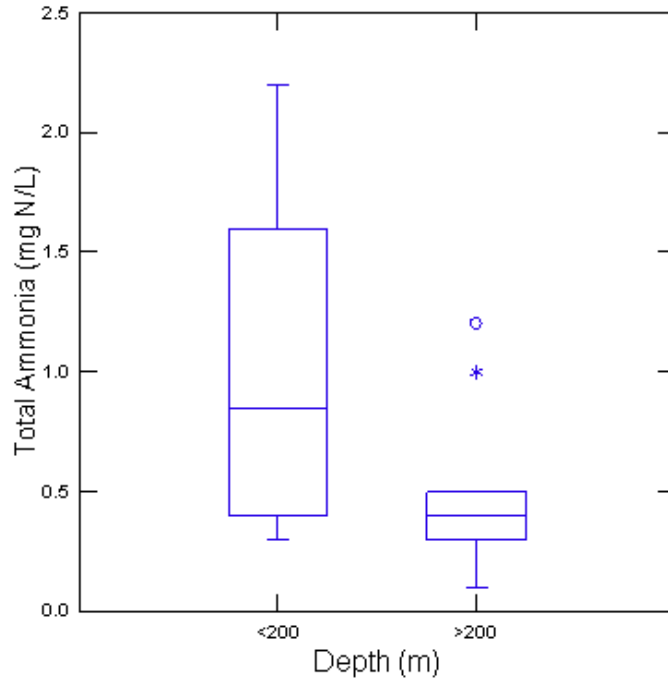
**Figure B-18 Summary Sulphate Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 14; >200 = 34.

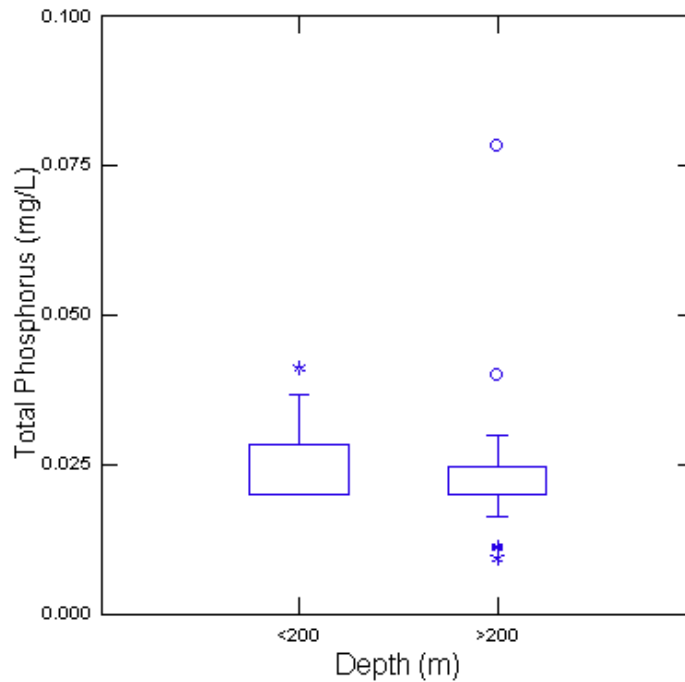
### Nutrients

**Figure B-19 Summary Total Ammonia Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



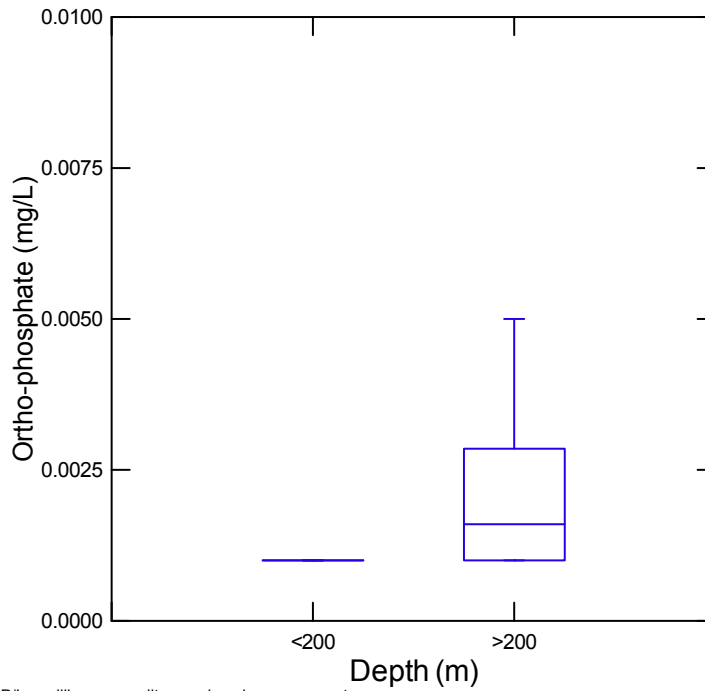
**Note:** mg N/L = milligrams per litre as nitrogen; m = metre.  
Sample count per site: <200 = 10; >200 = 13.

**Figure B-20 Summary Total Phosphorus Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



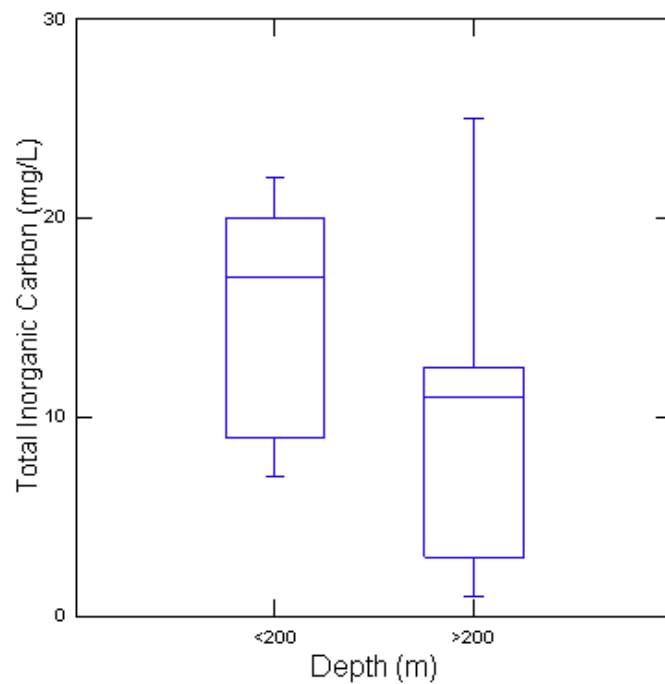
**Note:** mg P/L = milligrams per litre as phosphorus; m = metre.  
Sample count per site: <200 = 10; >200 = 13.  
An extreme outlier of 0.221 mg/L at <200 metres is not shown.

**Figure B-21 Summary Orthophosphate Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** mg P/L = milligrams per litre as phosphorus; m = metre.  
Sample count per site: <200 = 10; >200 = 13.  
An extreme outlier of 0.054 mg/L at >200 metres is not shown.

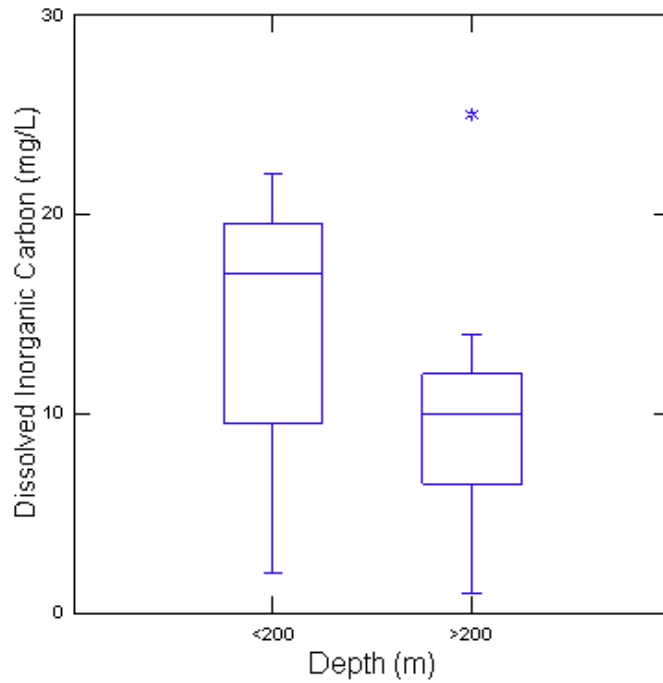
**Figure B-22 Summary Total Inorganic Carbon Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 6; >200 = 12.

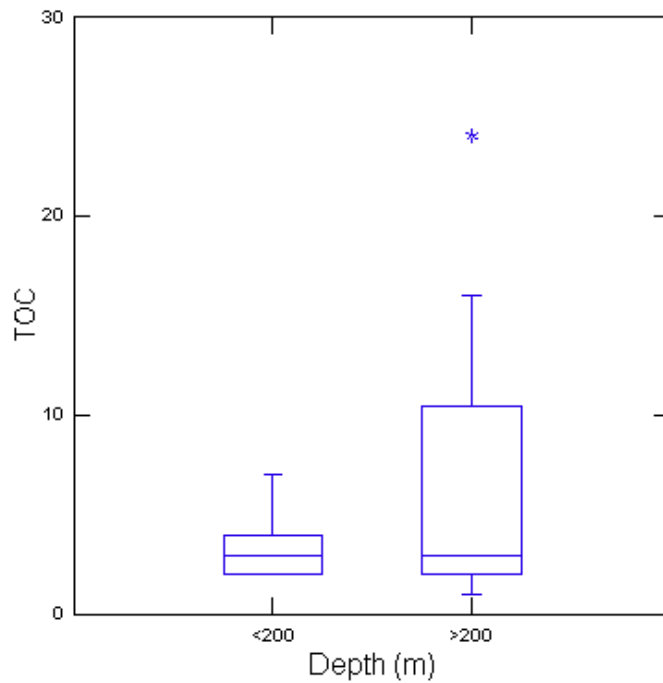


**Figure B-23 Summary Dissolved Inorganic Carbon Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



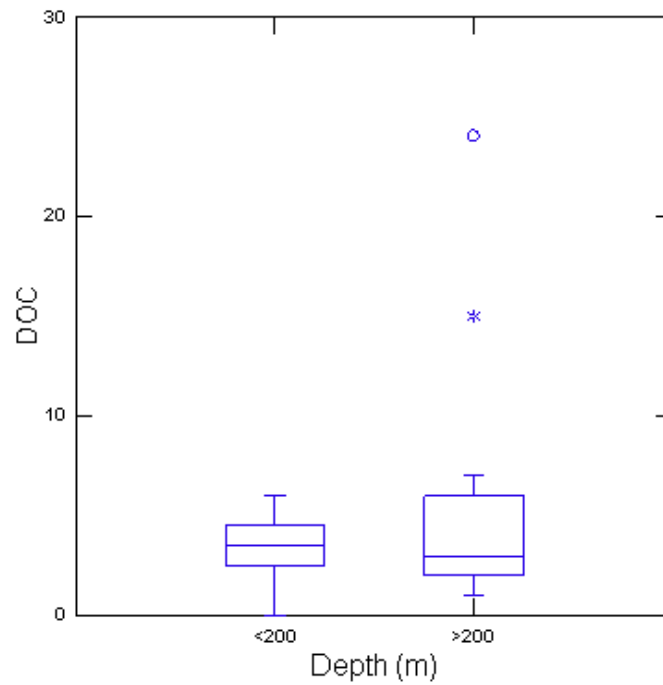
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 3; >200 = 11.

**Figure B-24 Summary Total Organic Carbon Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 6; >200 = 12.

**Figure B-25 Summary Dissolved Organic Carbon Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed Area**

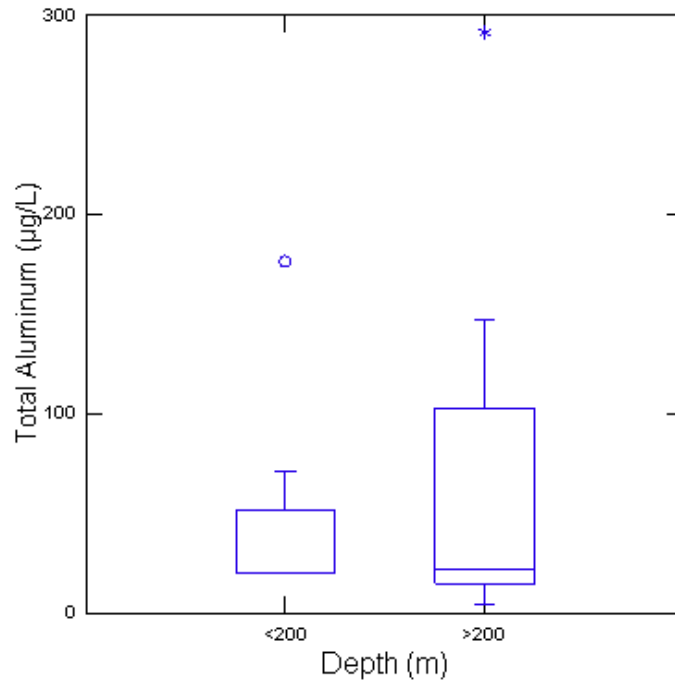


**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 3; >200 = 11.

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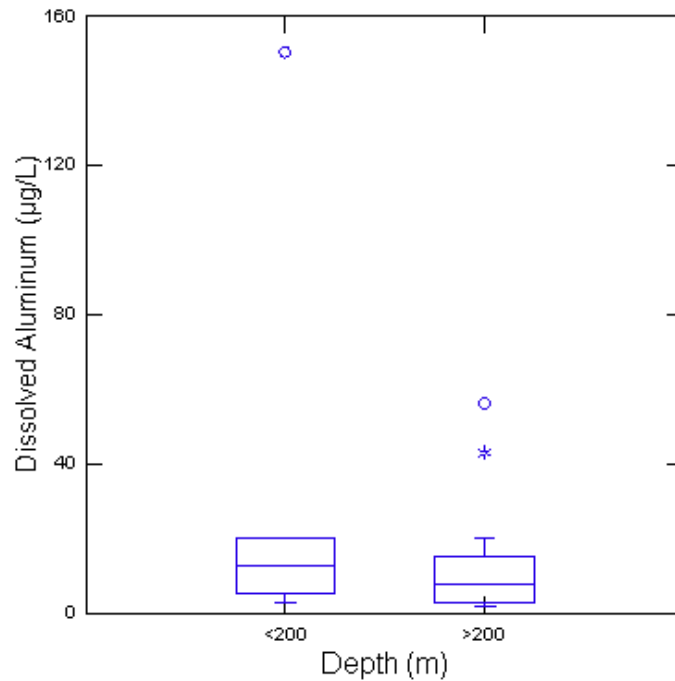
### Trace Metals

**Figure B-26 Summary Total Aluminum Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



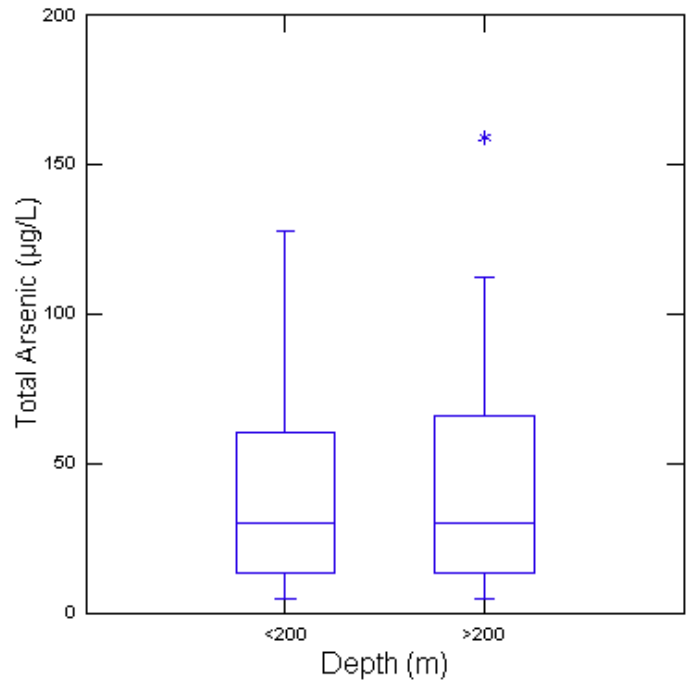
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 7; >200 = 11.  
An extreme outlier of 2,060 µg/L at <200 metres is not shown.

**Figure B-27 Summary Dissolved Aluminum Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



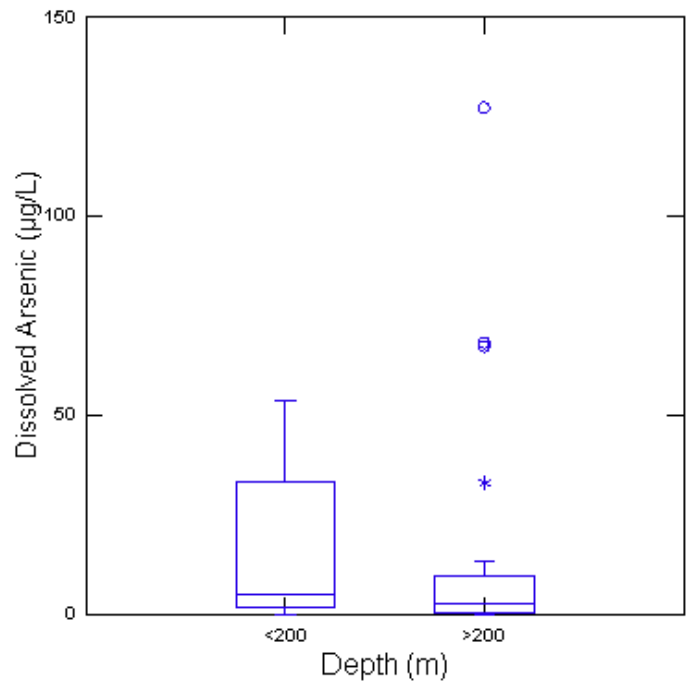
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 11; >200 = 20.

**Figure B-28 Summary Total Arsenic Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

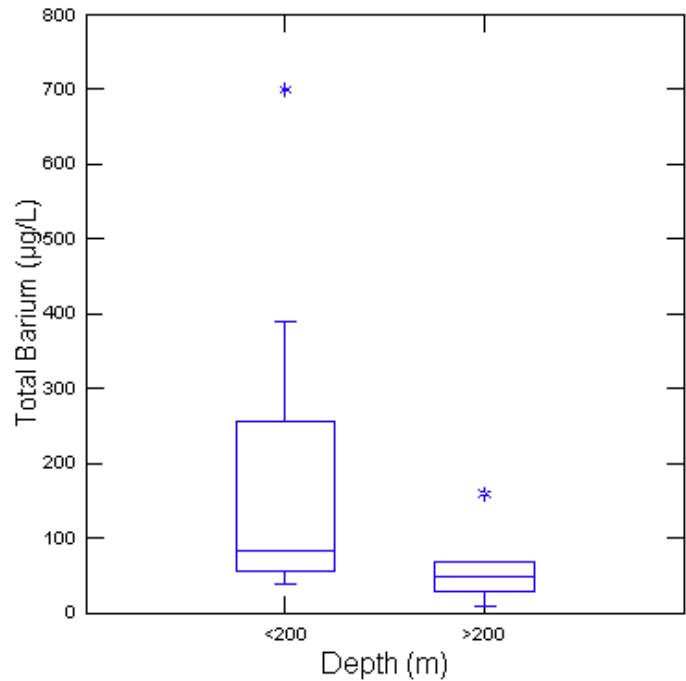
**Figure B-29 Summary Dissolved Arsenic Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 11; >200 = 20.

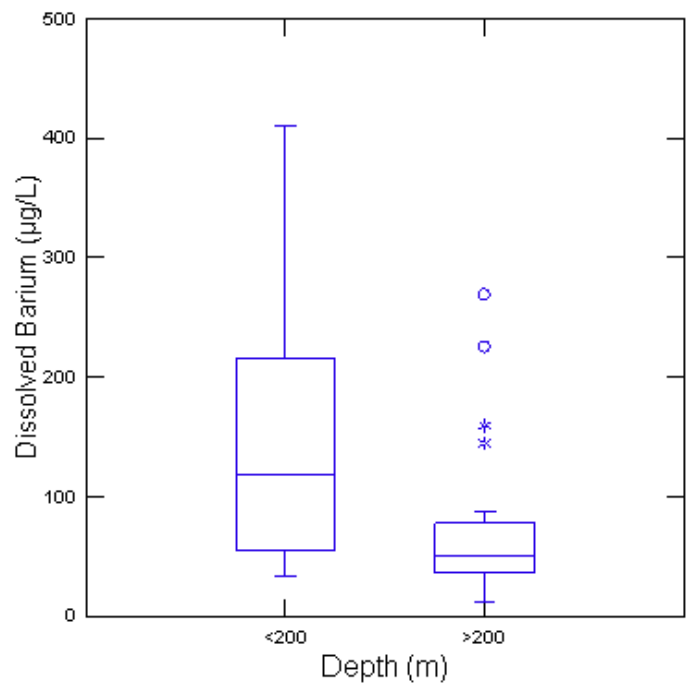
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**Figure B-30 Summary Total Barium Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

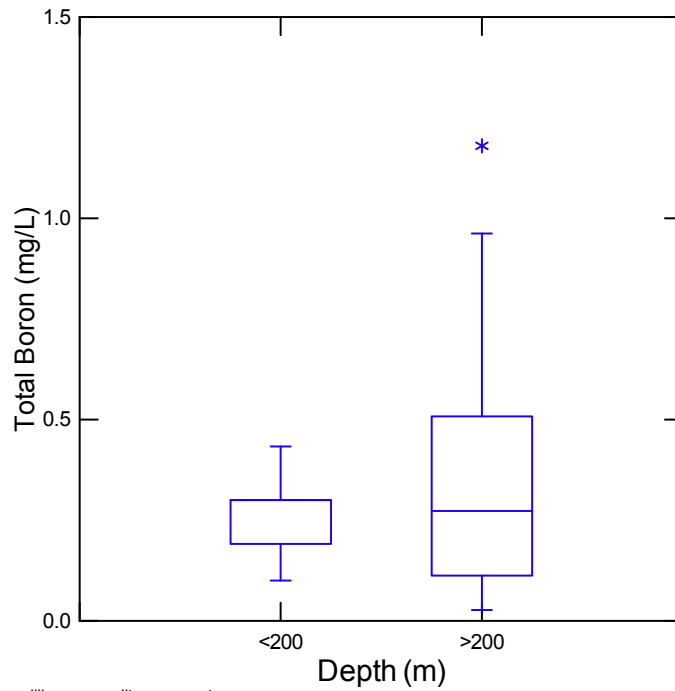
**Figure B-31 Summary Dissolved Barium for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 11; >200 = 20.

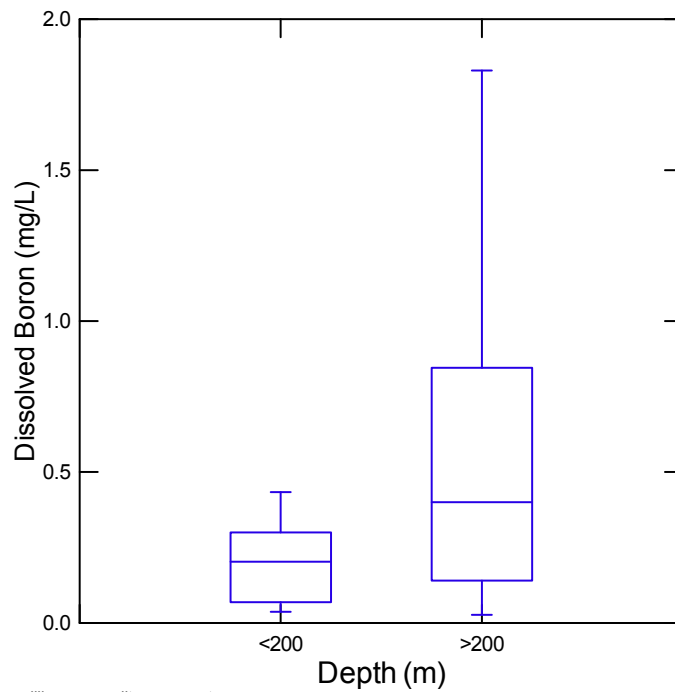
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**Figure B-32 Summary Total Boron Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



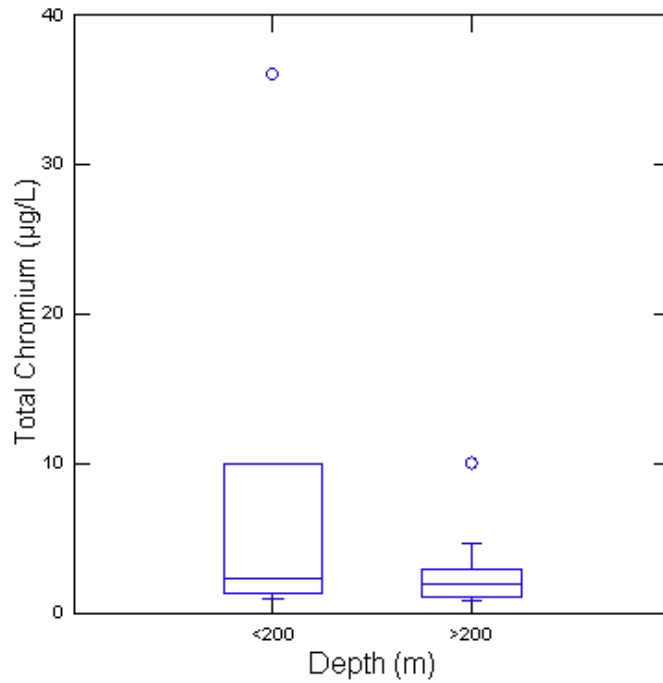
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

**Figure B-33 Summary Dissolved Boron Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



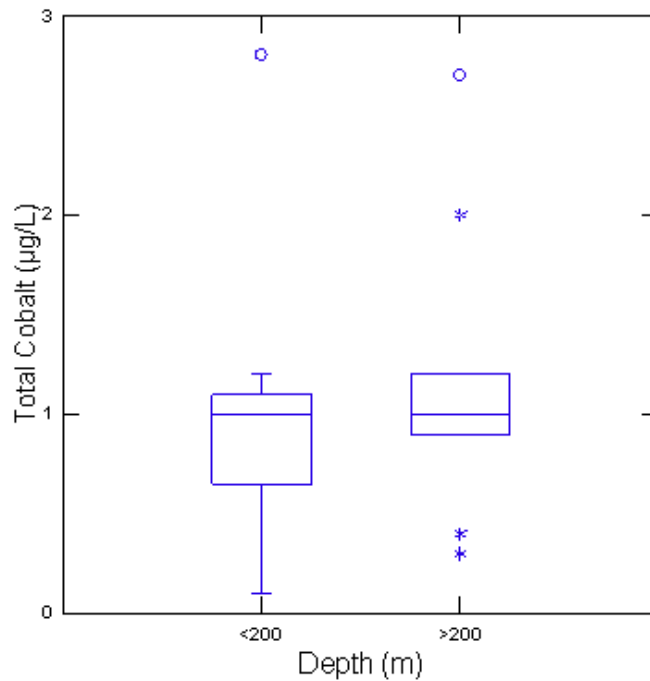
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 10; >200 = 19.  
Extreme outliers of 3.72 mg/L at >200 metres and 5.0 mg/L at <200 metres are not shown.

**Figure B-34 Summary Total Chromium Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.  
Summary plots for dissolved chromium and cobalt are not provided as greater than 50% of the dissolved chromium and cobalt concentrations were below detection

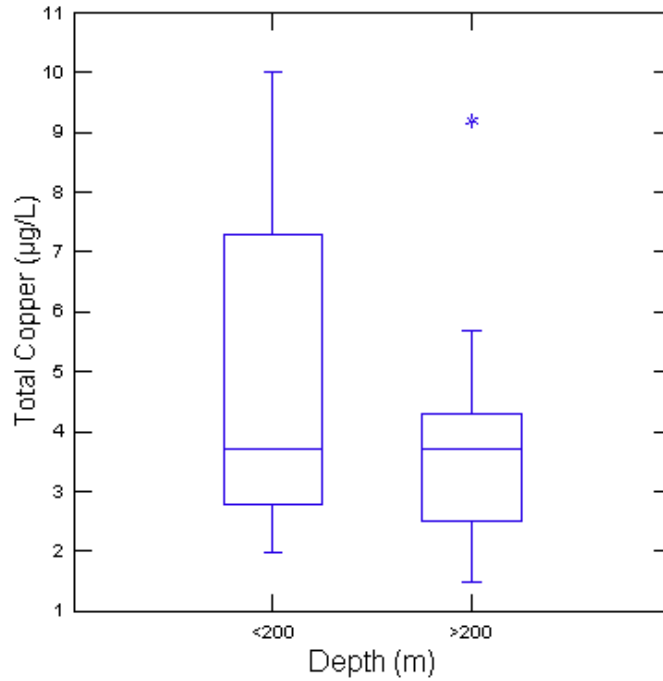
**Figure B-35 Summary Total Cobalt Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

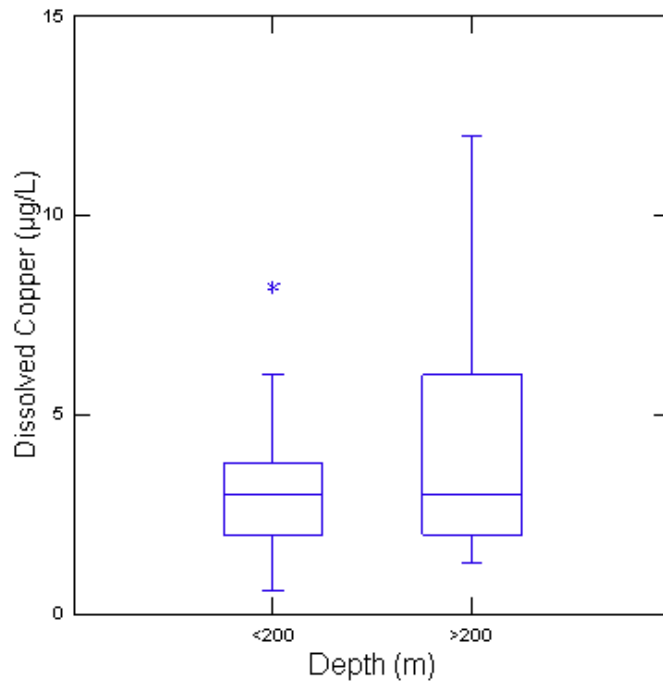
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**Figure B-36 Summary Total Copper Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

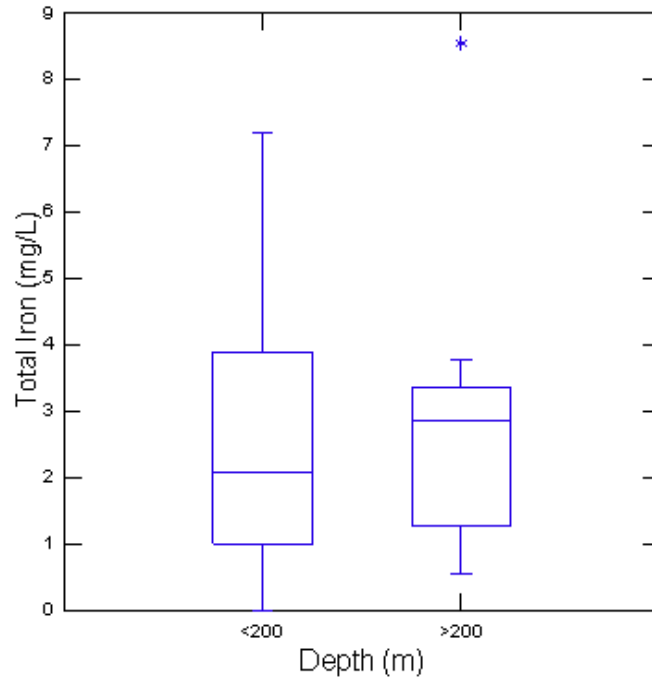
**Figure B-37 Summary Dissolved Copper Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 11; >200 = 20.

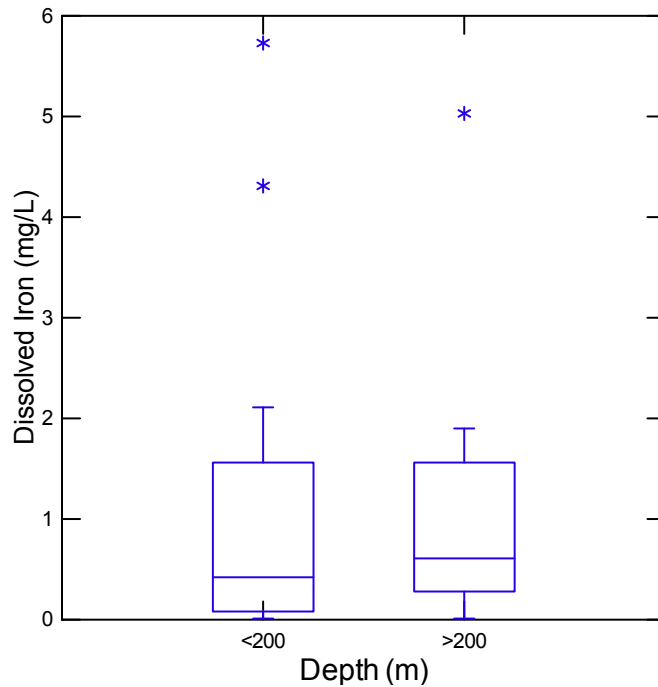


**Figure B-38 Summary Total Iron Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



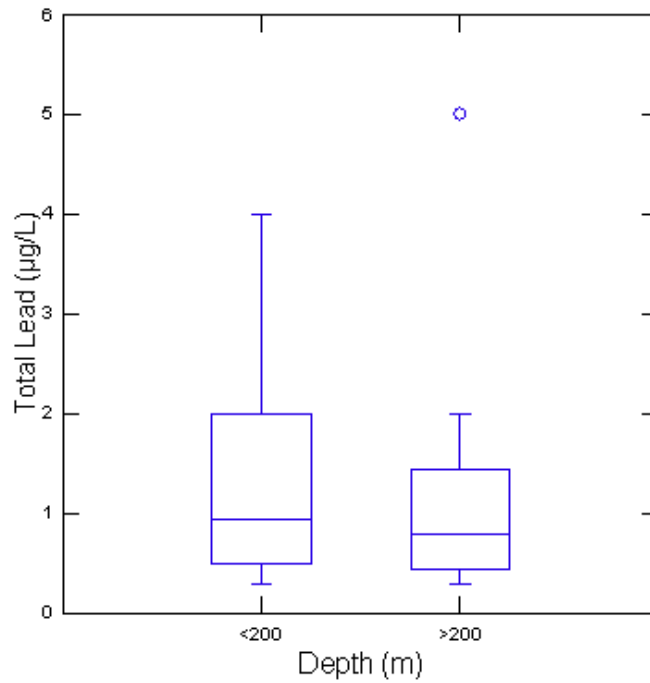
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

**Figure B-39 Summary Dissolved Iron Concentrations for Each Depth Zone in Developed Boreholes within the Kennedy Lake Watershed**



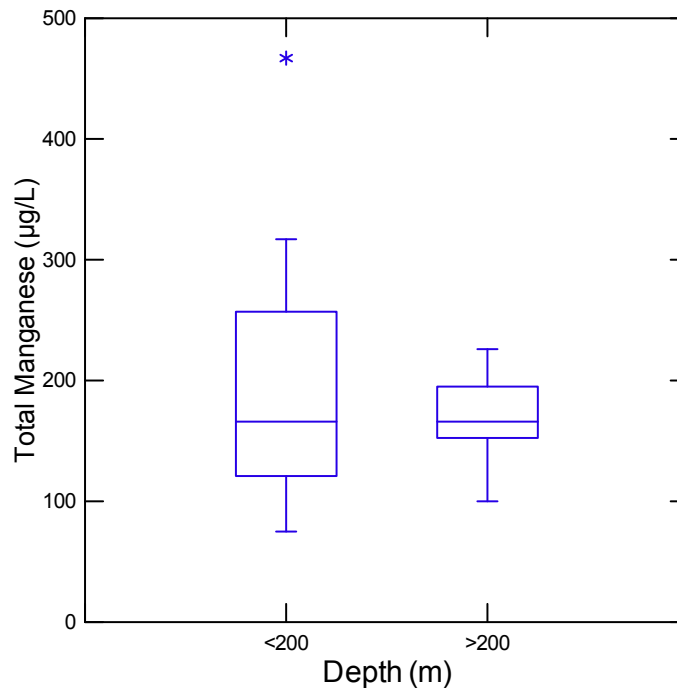
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 11; >200 = 20.

**Figure B-40 Summary Total Lead Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



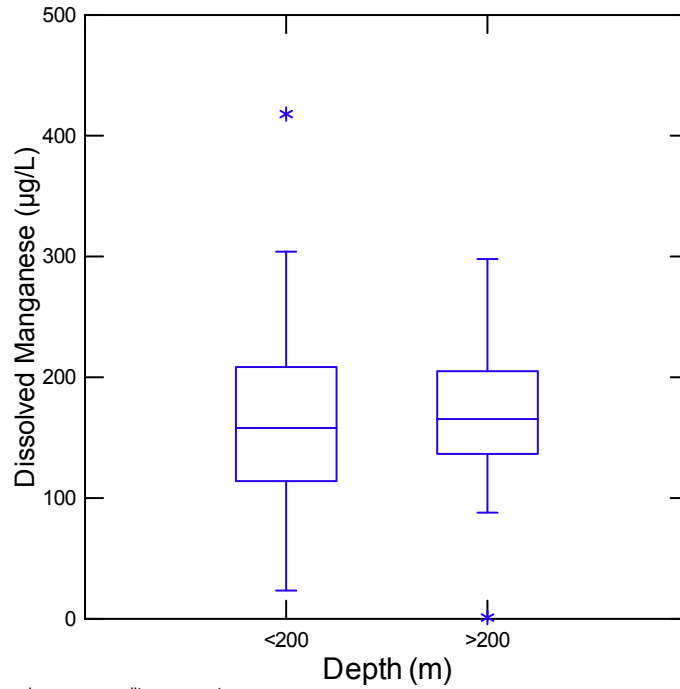
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.  
A summary plot for dissolved lead is not provided as greater than 50% of the dissolved lead concentrations were below detection

**Figure B-41 Summary Total Manganese Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



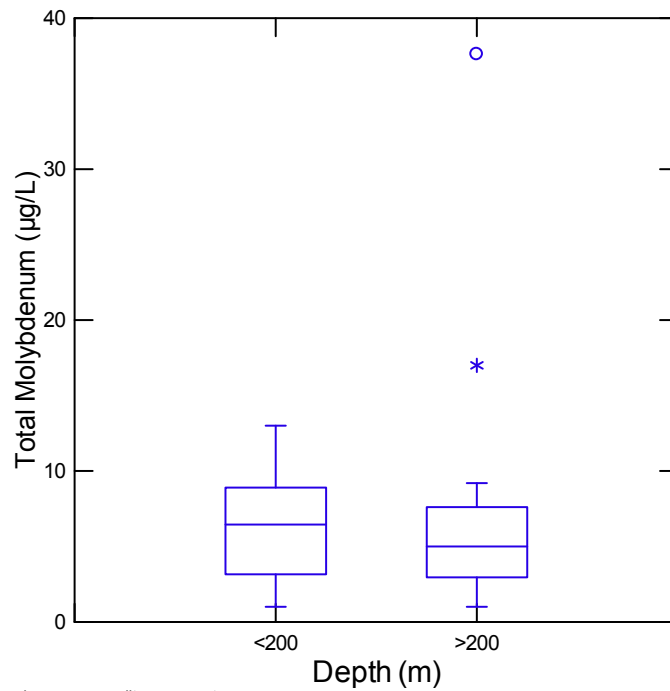
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

**Figure B-42 Summary Dissolved Manganese Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



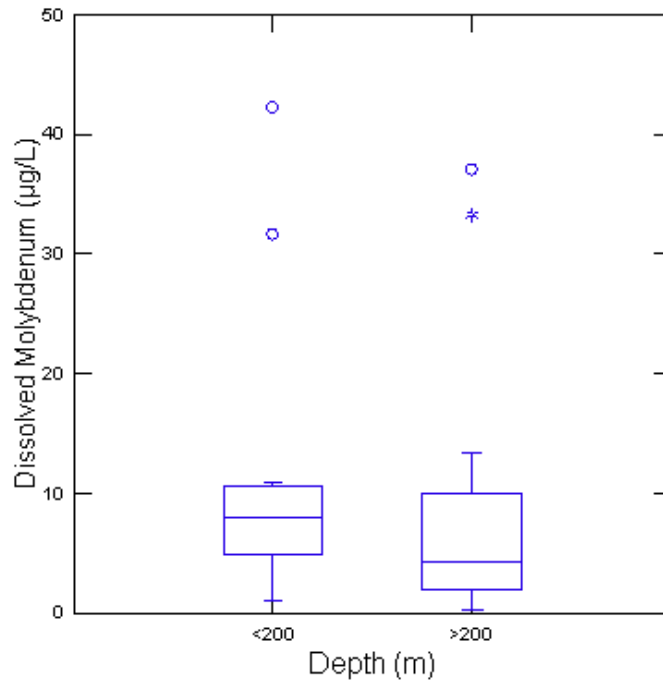
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 11; >200 = 20.

**Figure B-43 Summary Total Molybdenum Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



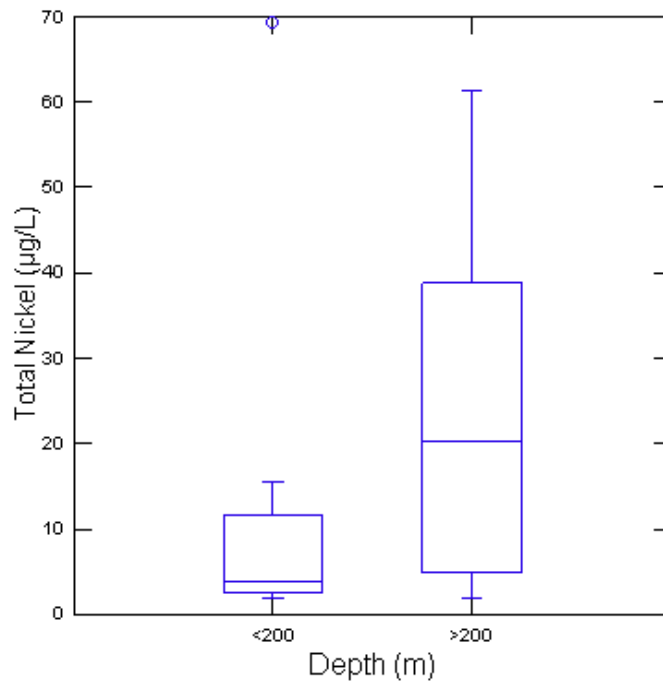
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

**Figure B-44 Summary Dissolved Molybdenum Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



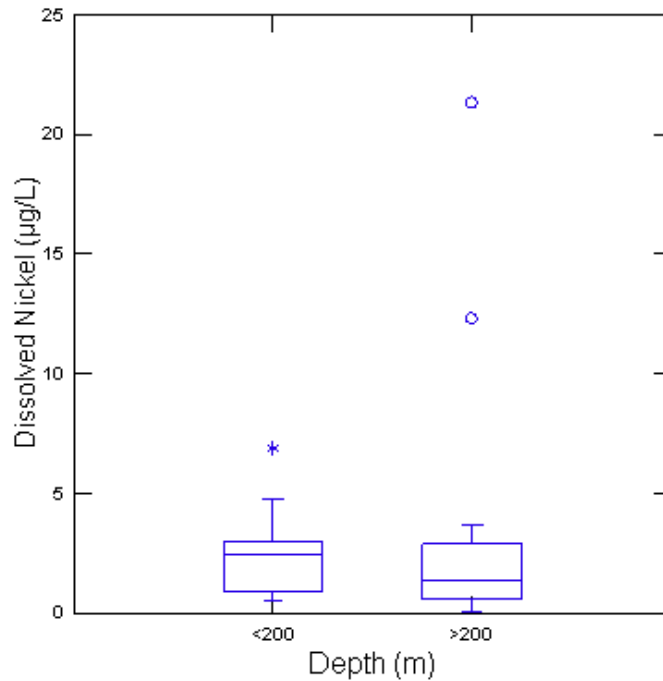
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 11; >200 = 20.

**Figure B-45 Summary Total Nickel Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



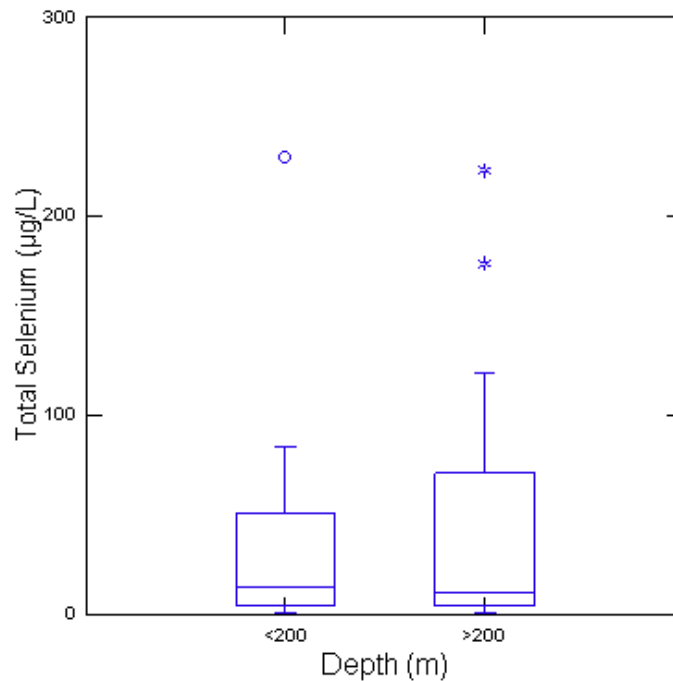
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

**Figure B-46 Summary Dissolved Nickel Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



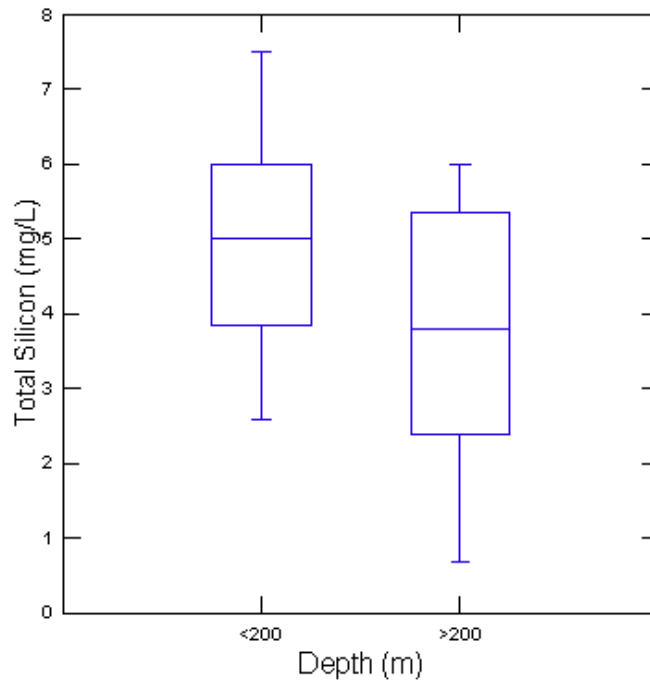
**Note:** µg/L = micrograms per litre; m = metre; Sample count per site: <200 = 10; >200 = 18.  
Extreme outliers of 37.7 µg/L at <200 metres, and 35.9 µg/L and 44.3 µg/L at >200 metres are not shown.

**Figure B-47 Summary Total Selenium Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



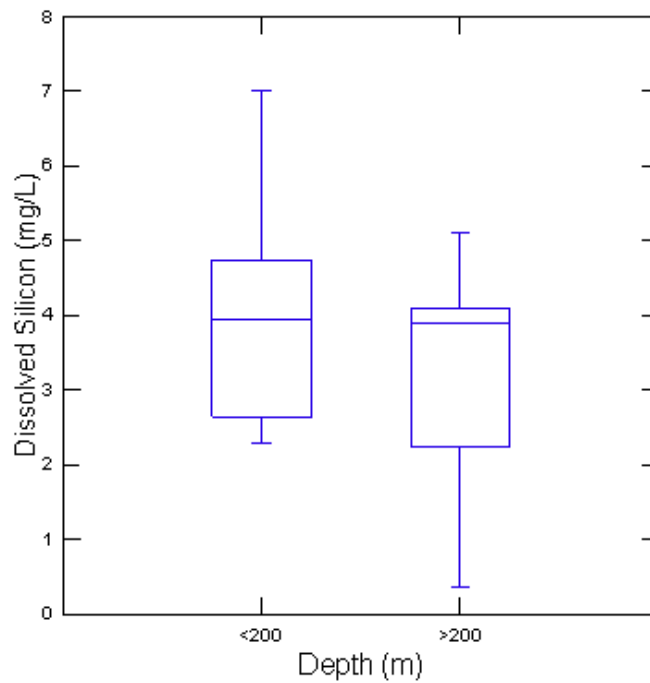
**Note:** µg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.  
A summary plot for dissolved selenium is not provided as greater than 50% of the dissolved selenium concentrations were below detection

**Figure B-48 Summary Total Silicon Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



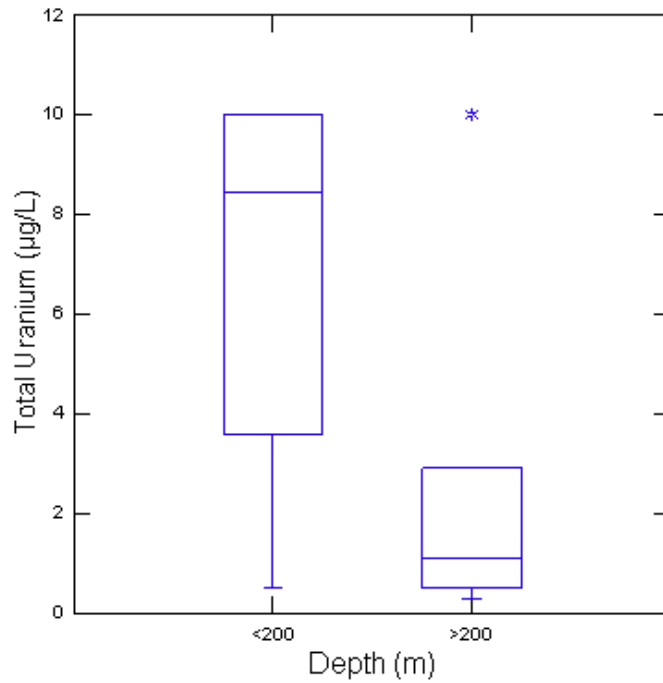
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

**Figure B-49 Summary Dissolved Silicon Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



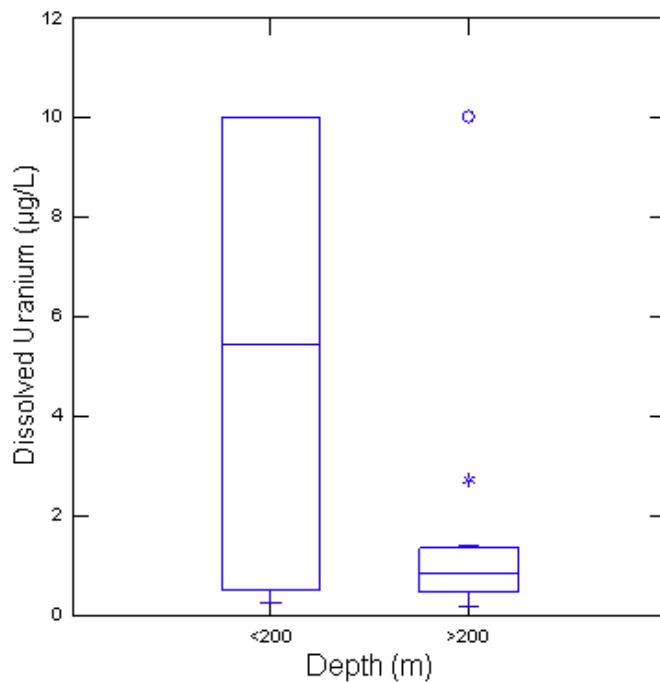
**Note:** mg/L = milligrams per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

**Figure B-50 Summary Total Uranium Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



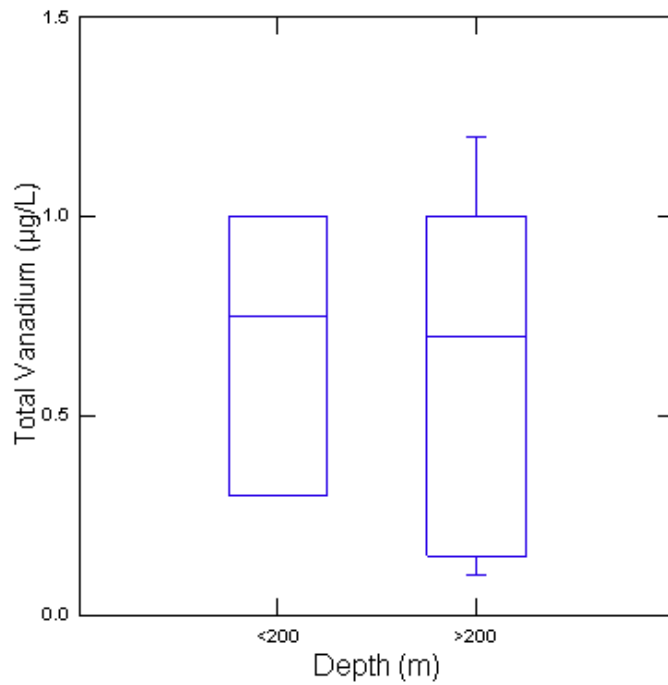
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 7; >200 = 11.  
An extreme outlier of 34.7 µg/L at <200 metres is not shown.

**Figure B-51 Summary Dissolved Uranium Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



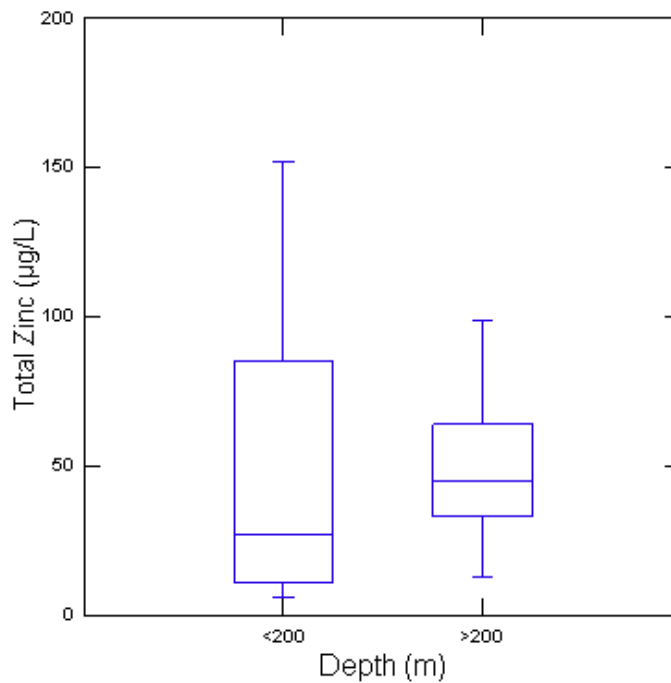
**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 10; >200 = 20.  
An extreme outlier of 31.5 µg/L at <200 metres is not shown.

**Figure B-52 Summary Total Vanadium Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.  
A summary plot for dissolved vanadium is not provided as greater than 50% of the dissolved vanadium concentrations were below detection

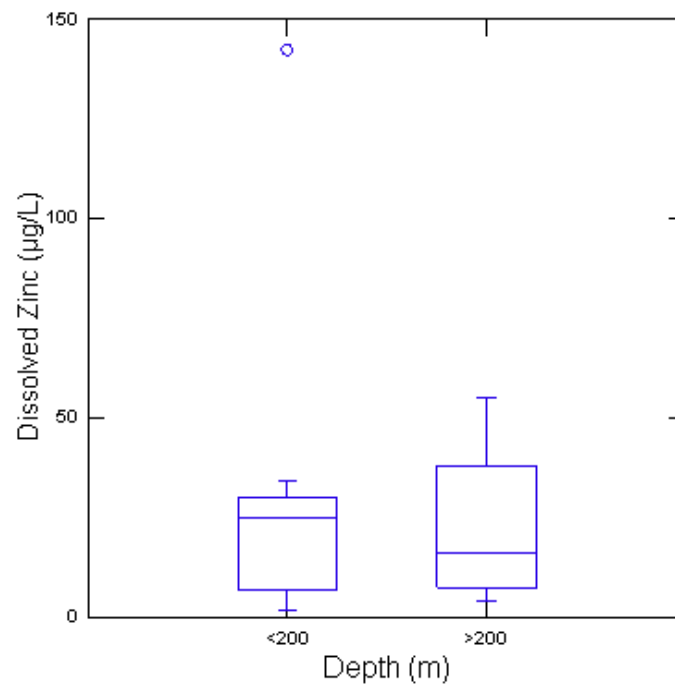
**Figure B-53 Summary Total Zinc Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 8; >200 = 11.

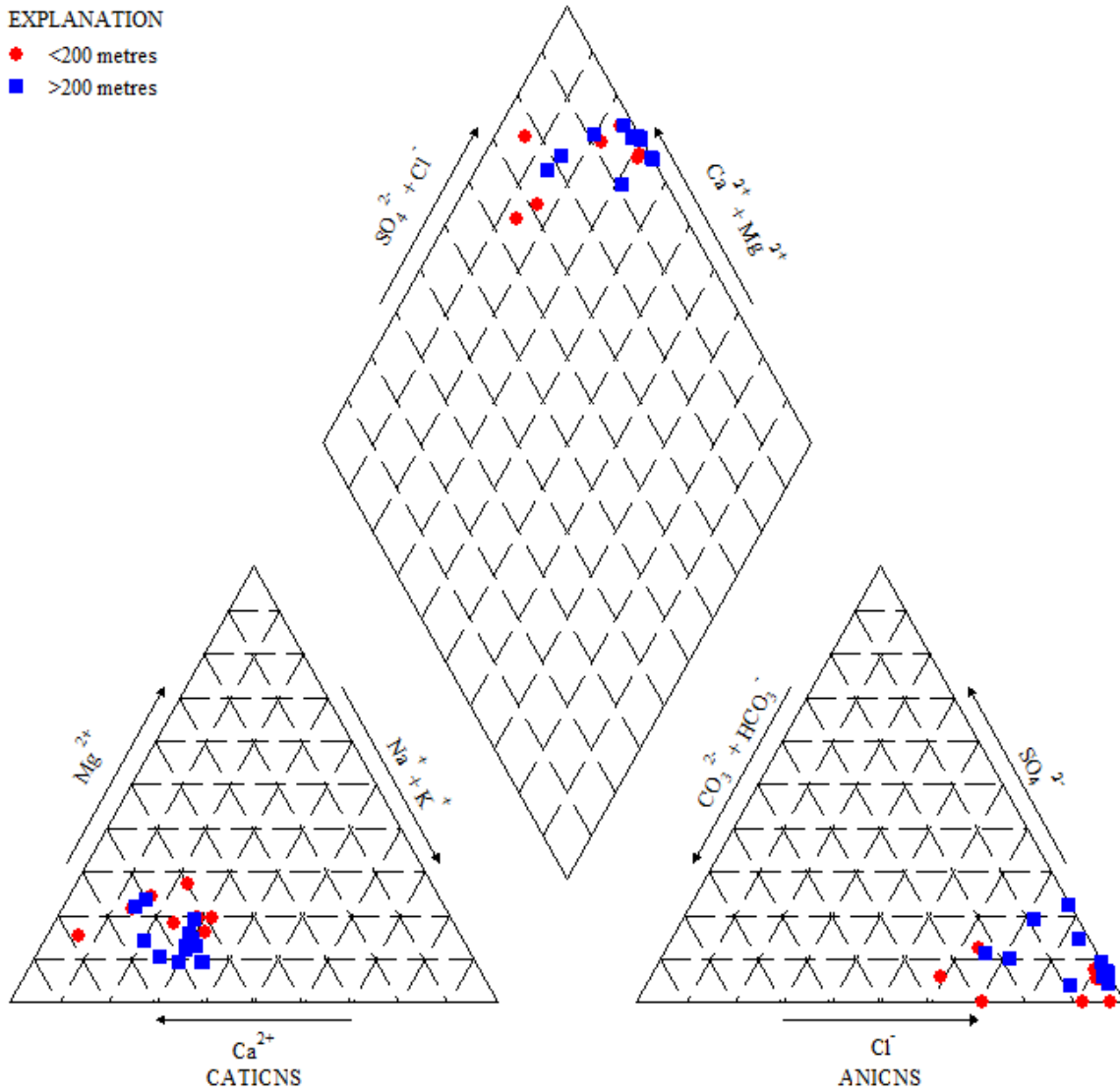


**Figure B-54 Summary Dissolved Zinc Concentrations for Each Depth Zone in Developed Boreholes within the Kennady Lake Watershed**



**Note:** µg/L = micrograms per litre; m = metre.  
Sample count per site: <200 = 11; >200 = 20.

**Figure B-55 Major Ion Distributions for Groundwater Samples Representing Two Depth Zones in Developed Boreholes within the Kennady Lake Watershed**



**Note:** Data applies to TDS at 105 °C.