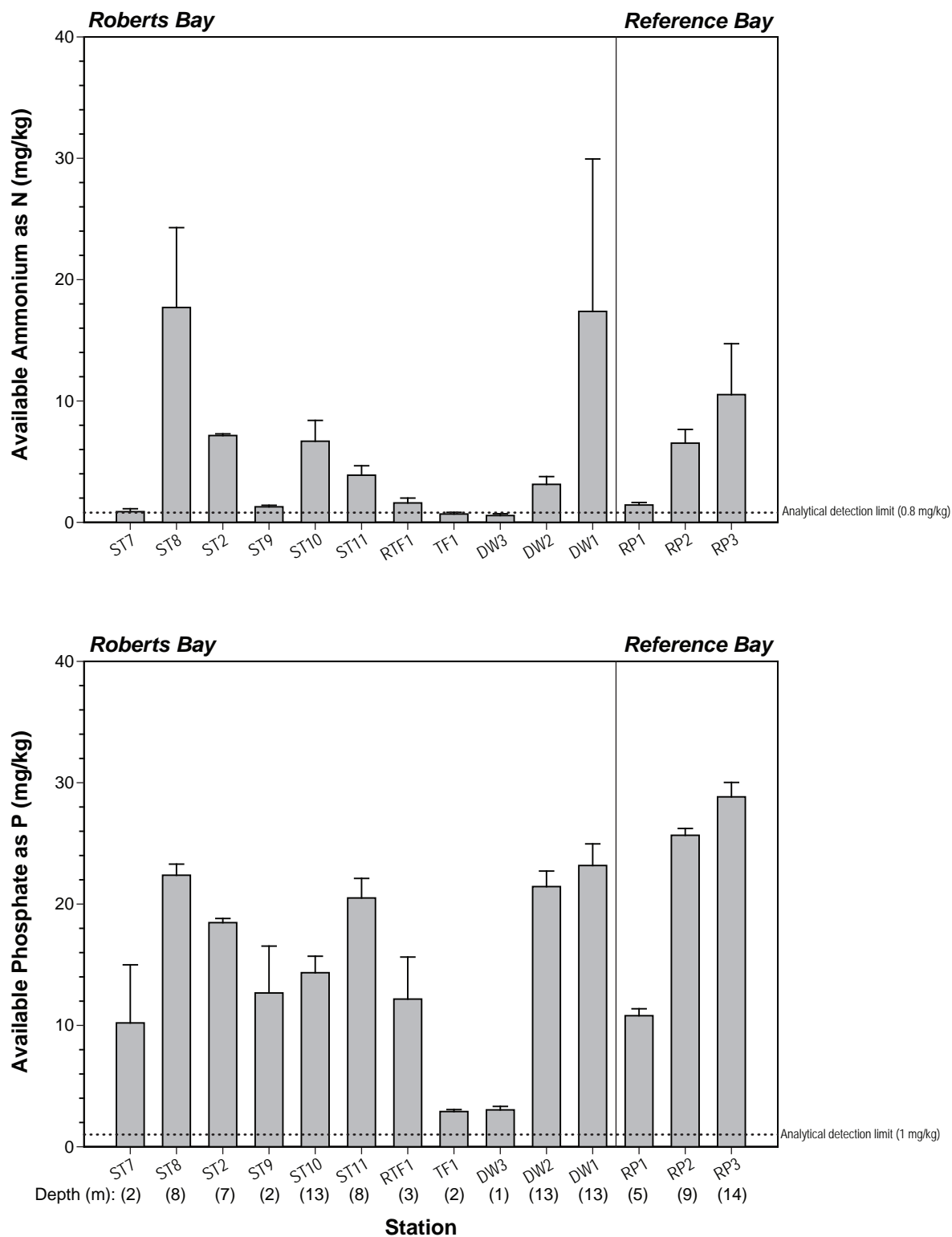
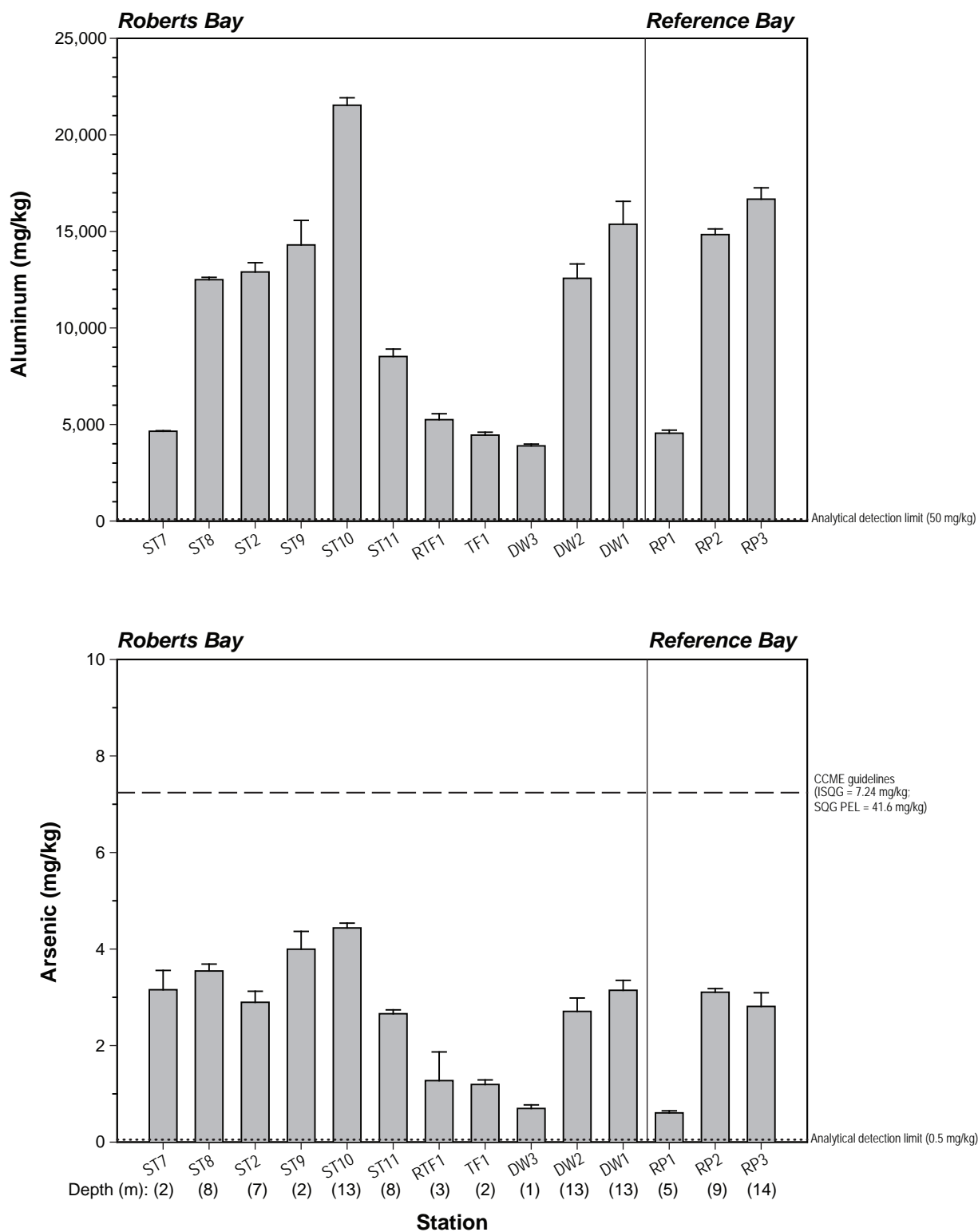


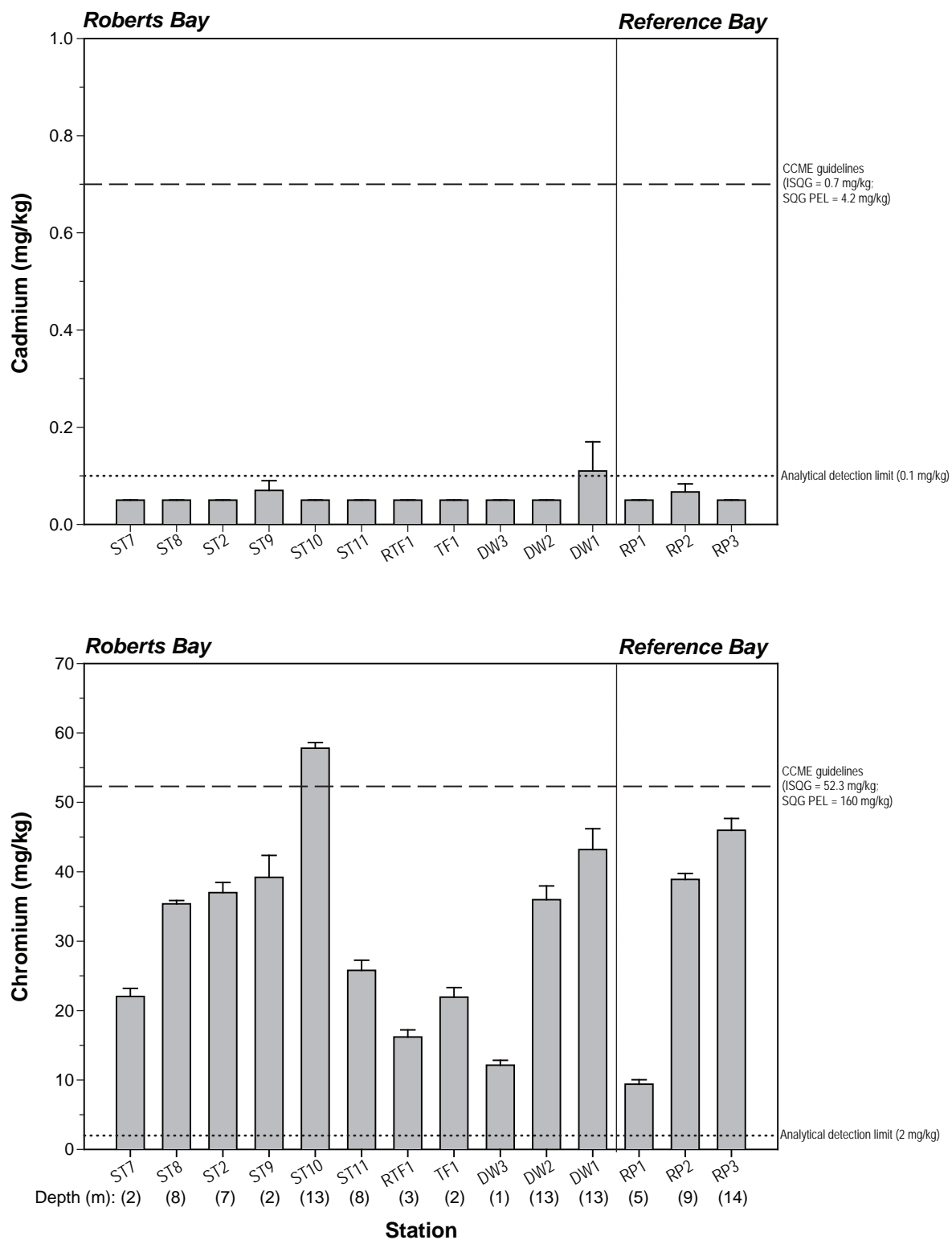
Notes: Error bars represent standard error of the mean.
Numbers in parentheses indicate sampling depths in metres.

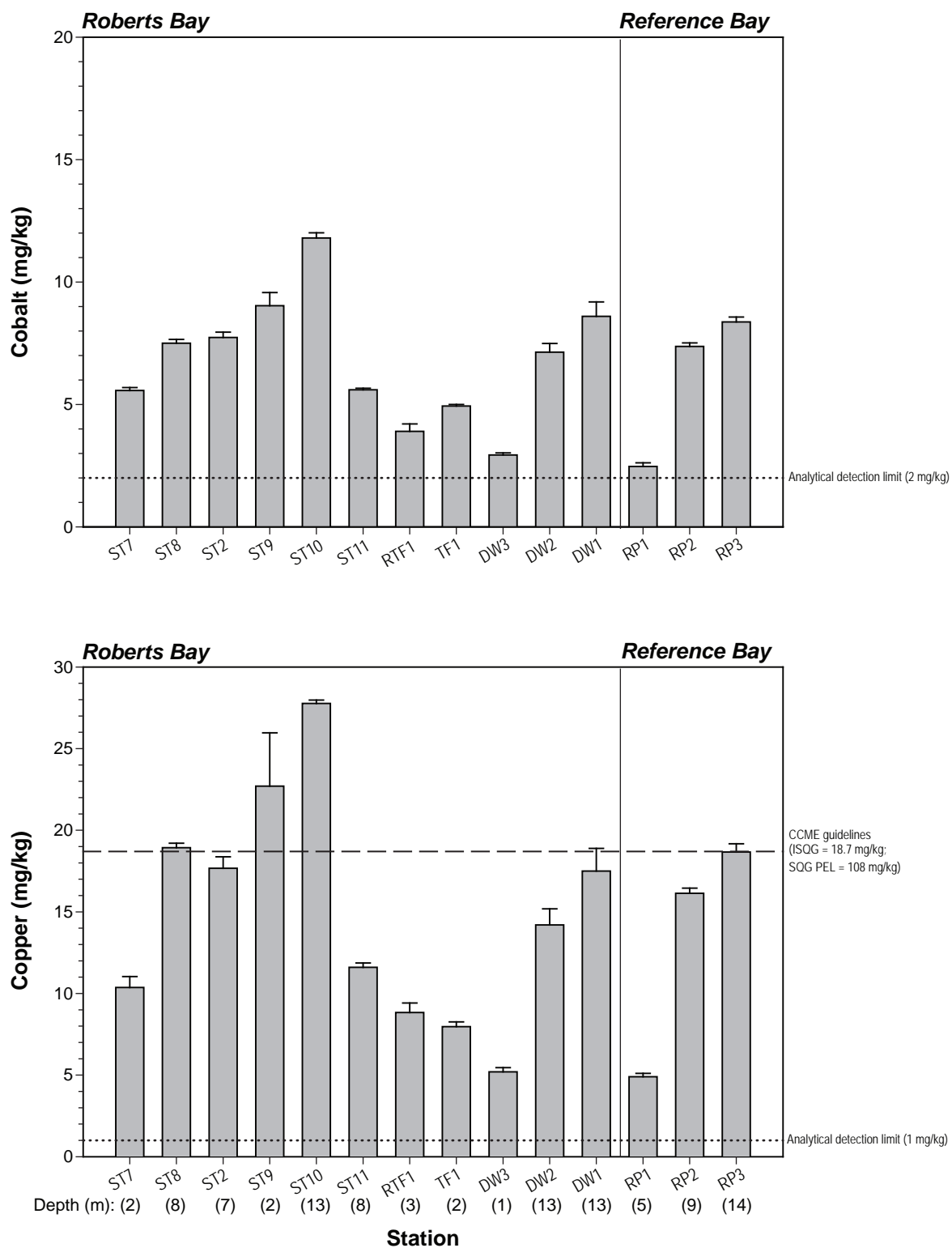
Figure 3.6-2





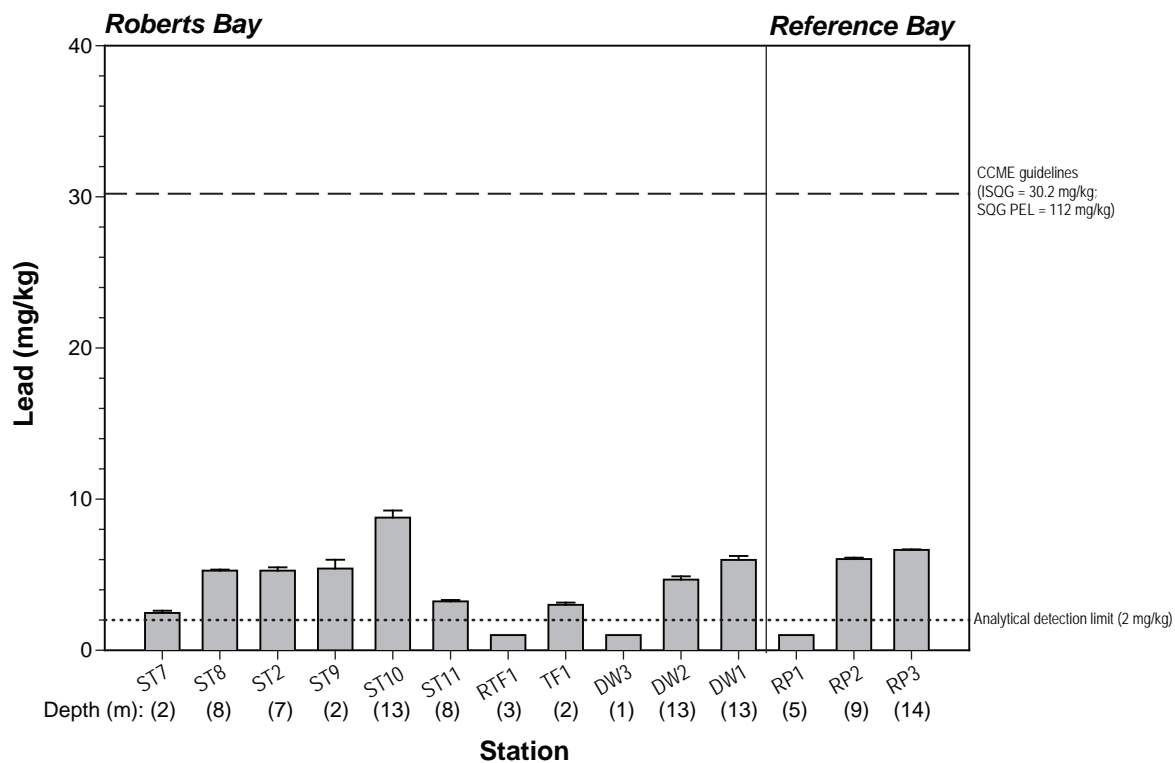
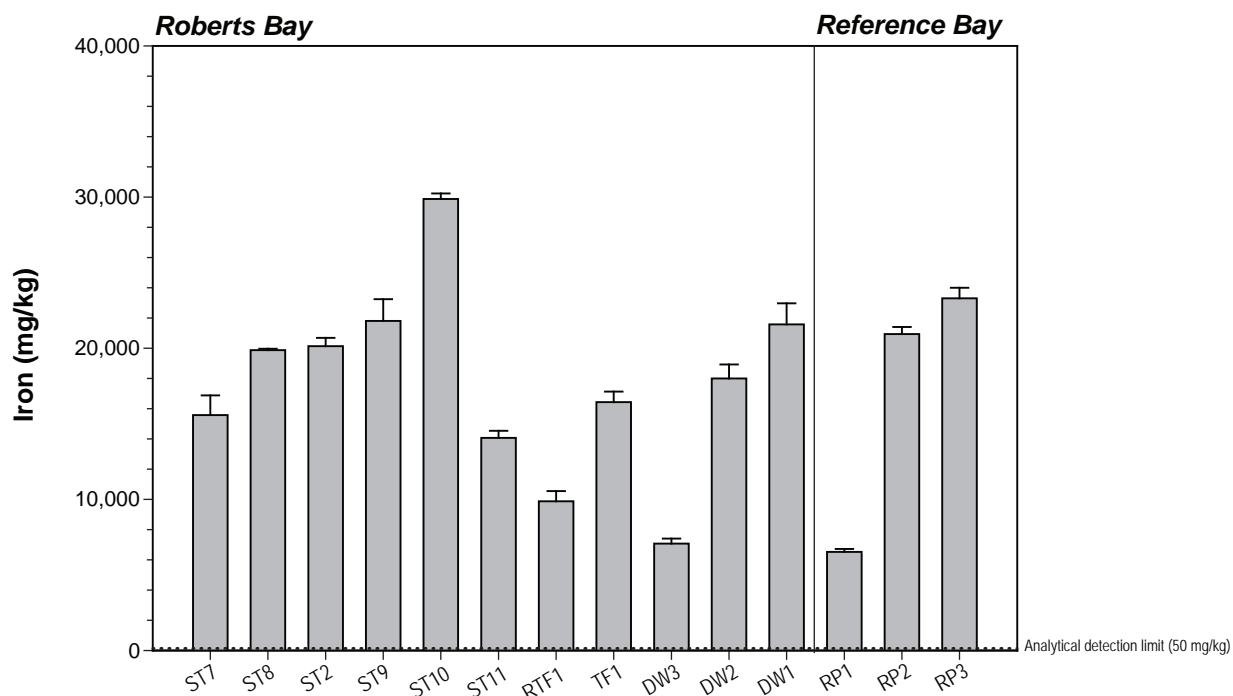
Notes: Error bars represent standard error of the mean.
Numbers in parentheses indicate sampling depths in metres.





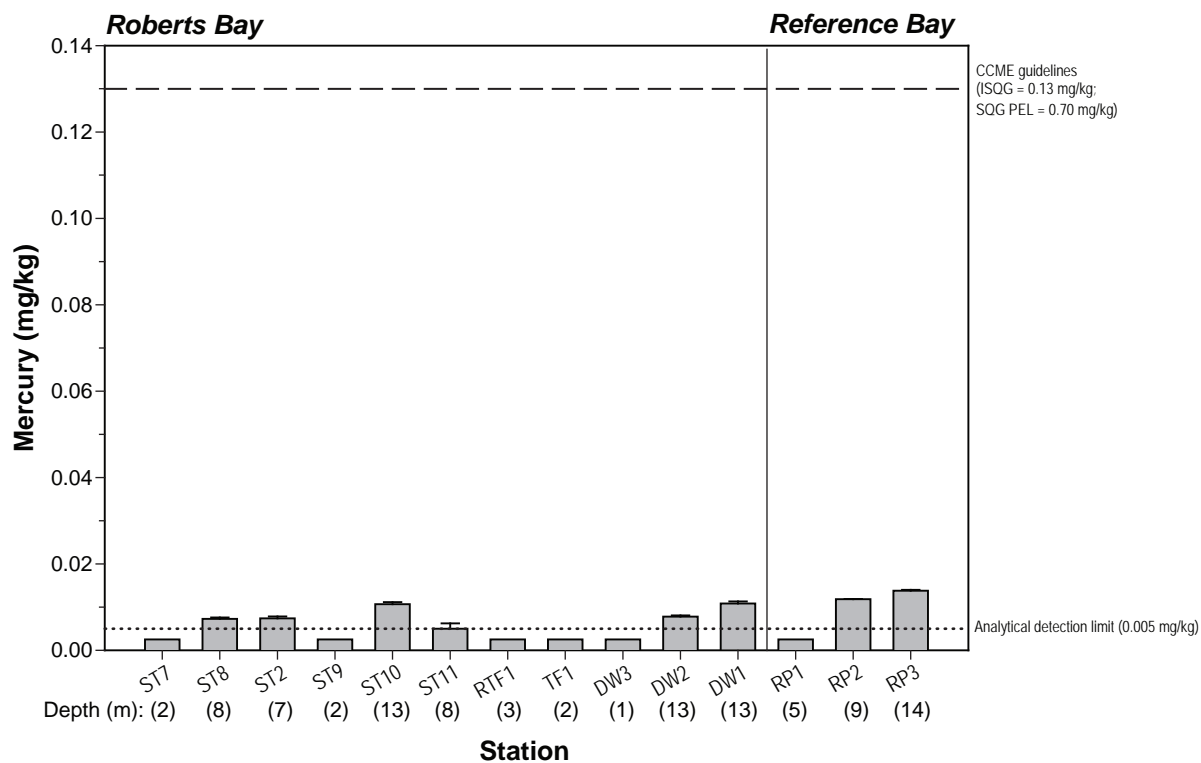
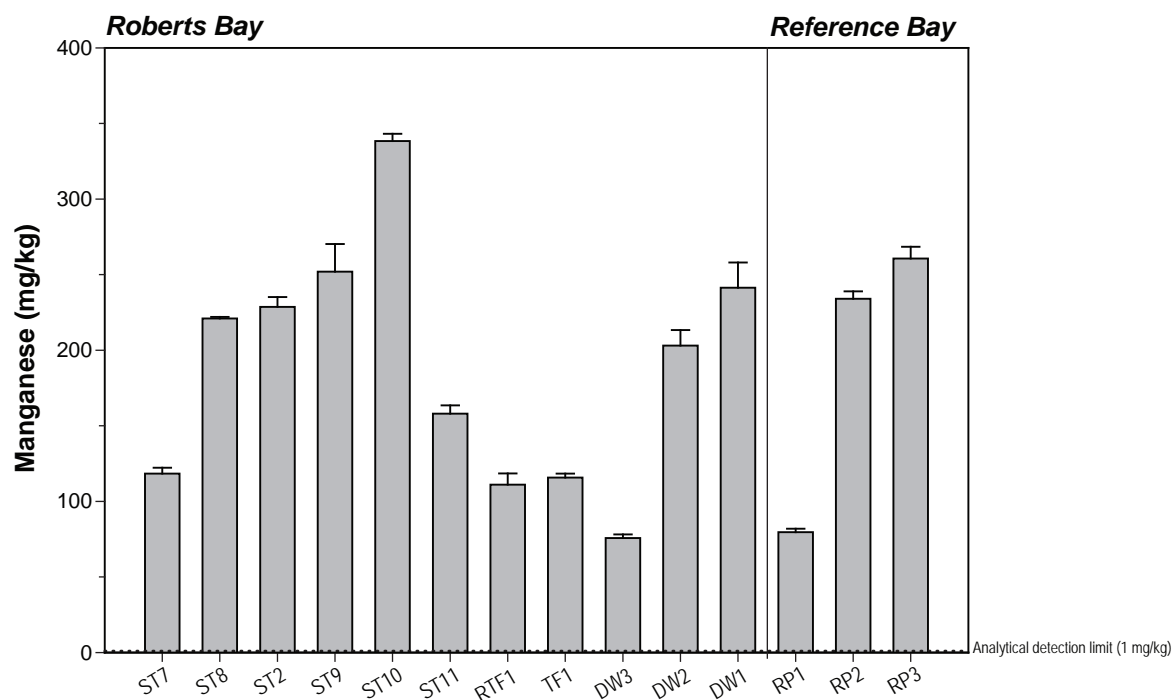
Notes: Error bars represent standard error of the mean.
Numbers in parentheses indicate sampling depths in metres.

Figure 3.6-6

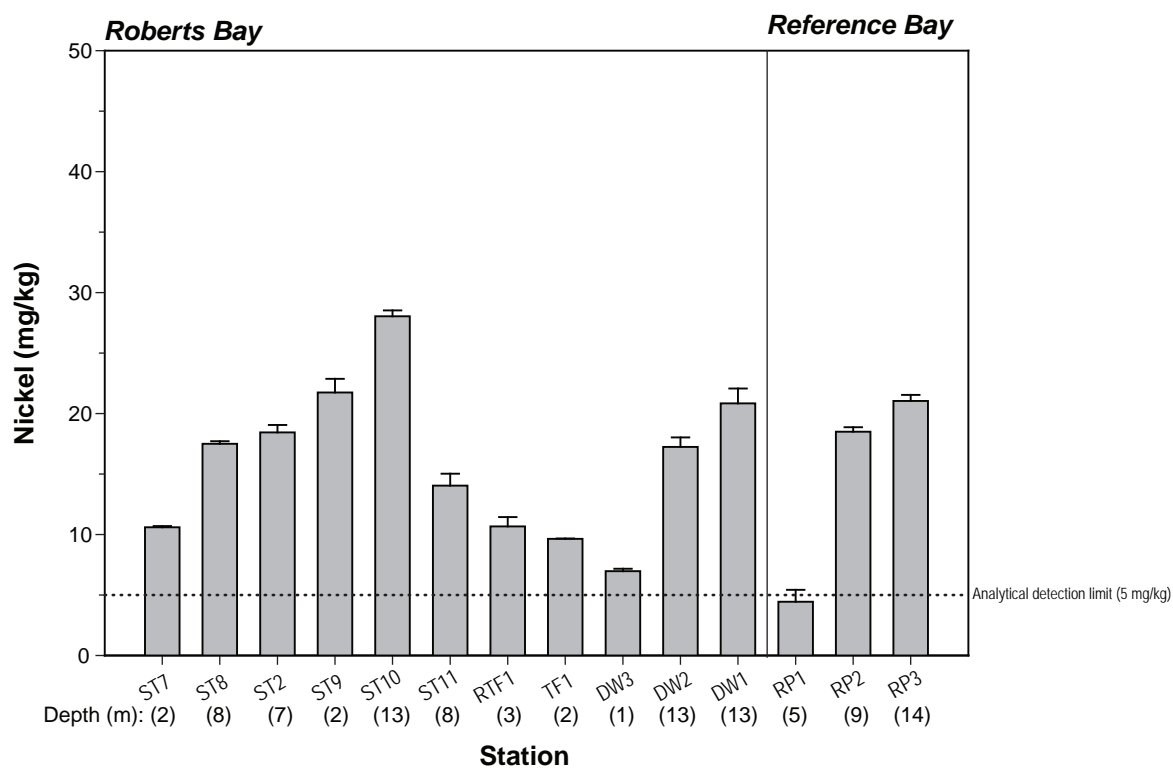
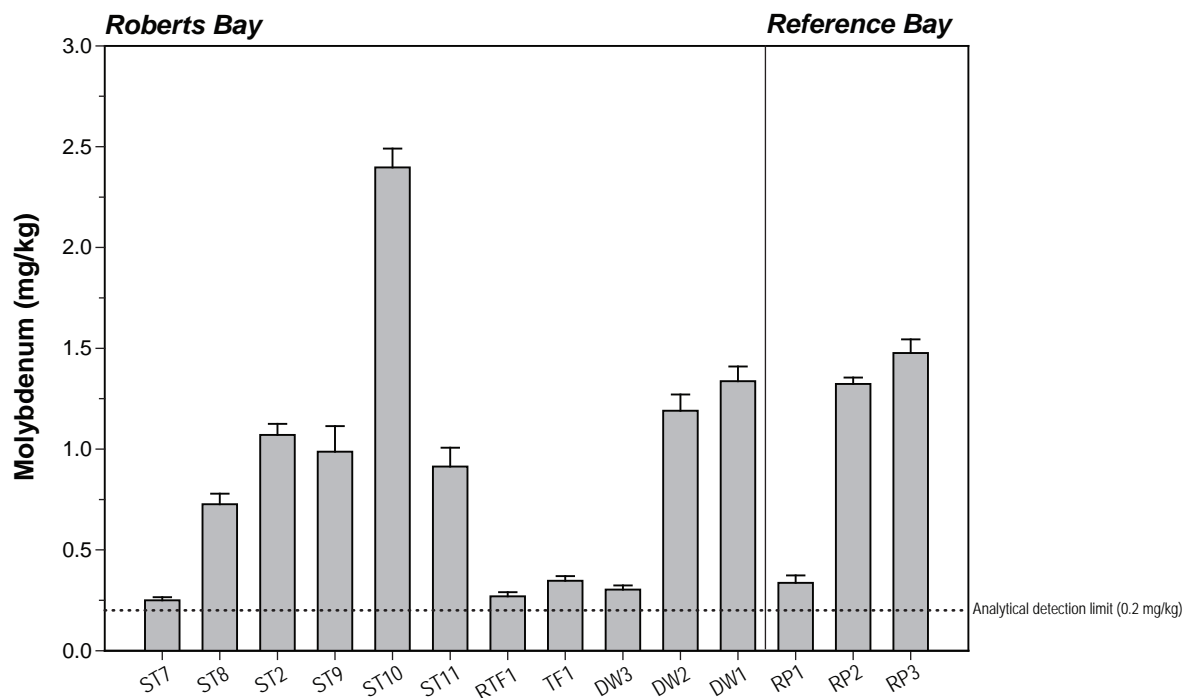


Notes: Error bars represent standard error of the mean.
Numbers in parentheses indicate sampling depths in metres.

Figure 3.6-7

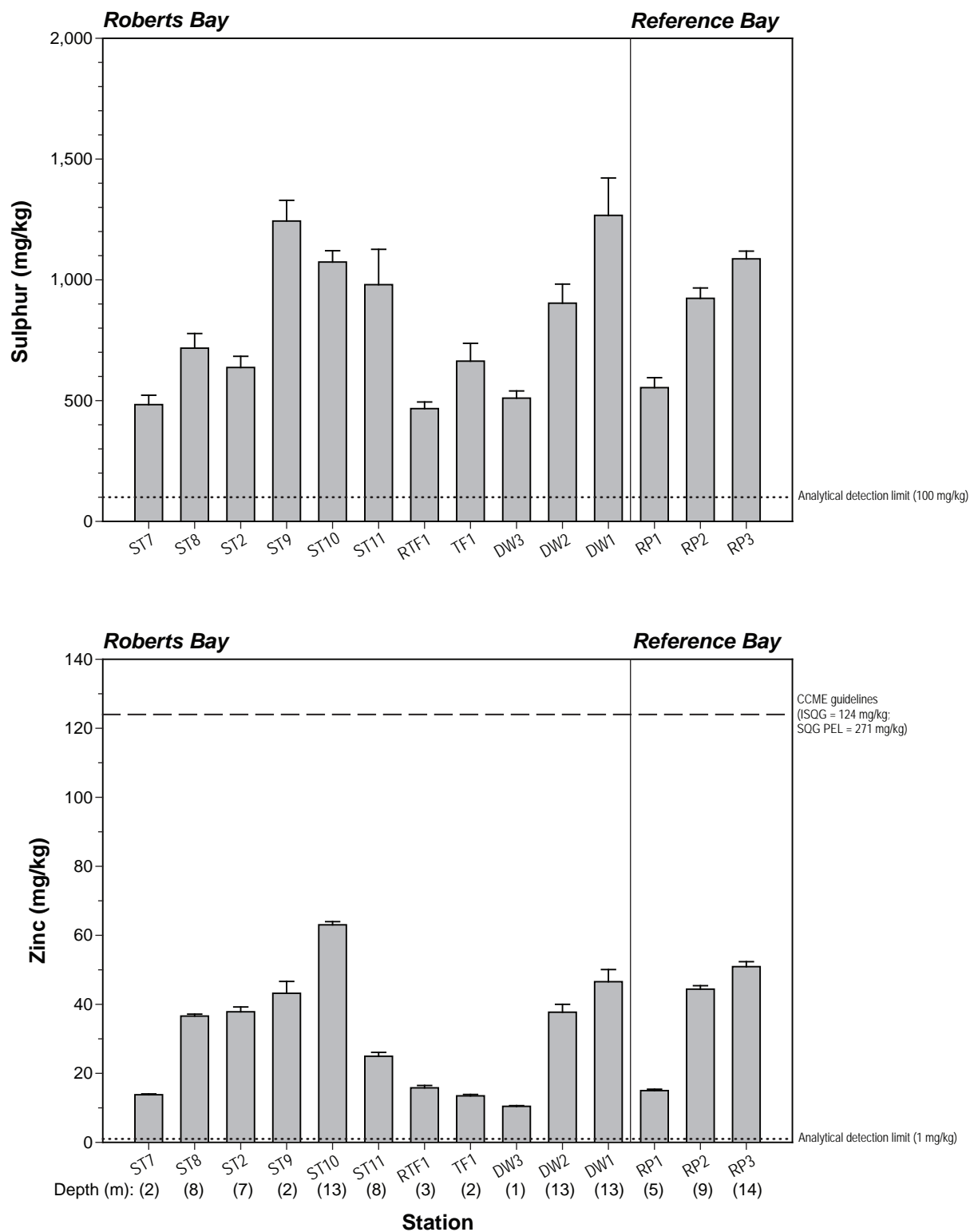


Notes: Error bars represent standard error of the mean.
Numbers in parentheses indicate sampling depths in metres.



Notes: Error bars represent standard error of the mean.
Numbers in parentheses indicate sampling depths in metres.

Figure 3.6-9



Notes: Error bars represent standard error of the mean.
Numbers in parentheses indicate sampling depths in metres.

Figure 3.6-10

Table 3.6-1. Marine Sediment Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, August 2009

Site	Total Number of Samples Collected	CCME Guideline Value ^a (mg/kg):	Percent of Samples Higher than ISQG ^b Guidelines						
			Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
			7.24	0.7	52.3	18.7	30.2	0.13	124
Roberts Bay									
ST7	3		0	0	0	0	0	0	0
ST8	3		0	0	0	67	0	0	0
ST2	3		0	0	0	33	0	0	0
ST9	3		0	0	0	67	0	0	0
ST10	3		0	0	100	100	0	0	0
ST11	3		0	0	0	0	0	0	0
RFT1	3		0	0	0	0	0	0	0
TF1	3		0	0	0	0	0	0	0
DW3	3		0	0	0	0	0	0	0
DW2	3		0	0	0	0	0	0	0
DW1	3		0	0	0	33	0	0	0
Reference Bay									
RP1	3		0	0	0	0	0	0	0
RP2	3		0	0	0	0	0	0	0
RP3	3		0	0	0	67	0	0	0
Site	Total Number of Samples Collected	CCME Guideline Value ^a (mg/kg):	Percent of Samples Higher than PEL ^c Guidelines						
			Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
			41.6	4.2	160	108	112	0.70	271
Roberts Bay									
ST7	3		0	0	0	0	0	0	0
ST8	3		0	0	0	0	0	0	0
ST2	3		0	0	0	0	0	0	0
ST9	3		0	0	0	0	0	0	0
ST10	3		0	0	0	0	0	0	0
ST11	3		0	0	0	0	0	0	0
RFT1	3		0	0	0	0	0	0	0
TF2	3		0	0	0	0	0	0	0
DW3	3		0	0	0	0	0	0	0
DW2	3		0	0	0	0	0	0	0
DW1	3		0	0	0	0	0	0	0
Reference Bay									
RP1	3		0	0	0	0	0	0	0
RP2	3		0	0	0	0	0	0	0
RP3	3		0	0	0	0	0	0	0

Values represent percentages of 2009 sediment samples in which concentrations are higher than CCME guidelines.

a) Canadian sediment quality guidelines for the protection of aquatic life (CCME 2002)

b) ISQG = Interim marine sediment quality guideline

c) PEL = Probable effects level

Table 3.6-2. Marine Sediment Quality, Factor by which Average Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, August 2009

Site	Total Number of Samples Collected	CCME Guideline Value ^a (mg/kg):	Factor by Which Concentrations are Higher than ISQG ^b Guidelines						
			Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
			7.24	0.7	52.3	18.7	30.2	0.13	124
Roberts Bay									
ST7	3		-	-	-	-	-	-	-
ST8	3		-	-	-	1.01	-	-	-
ST2	3		-	-	-	-	-	-	-
ST9	3		-	-	-	1.21	-	-	-
ST10	3		-	-	1.11	1.48	-	-	-
ST11	3		-	-	-	-	-	-	-
RFT1	3		-	-	-	-	-	-	-
TF1	3		-	-	-	-	-	-	-
DW3	3		-	-	-	-	-	-	-
DW2	3		-	-	-	-	-	-	-
DW1	3		-	-	-	-	-	-	-
Reference Bay									
RP1	3		-	-	-	-	-	-	-
RP2	3		-	-	-	-	-	-	-
RP3	3		-	-	-	-	-	-	-
Site	Total Number of Samples Collected	CCME Guideline Value ^a (mg/kg):	Factor by Which Concentrations are Higher than PEL ^c Guidelines						
			Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Zinc (Zn)
			41.6	4.2	160	108	112	0.70	271
Roberts Bay									
ST7	3		-	-	-	-	-	-	-
ST8	3		-	-	-	-	-	-	-
ST2	3		-	-	-	-	-	-	-
ST9	3		-	-	-	-	-	-	-
ST10	3		-	-	-	-	-	-	-
ST11	3		-	-	-	-	-	-	-
RFT1	3		-	-	-	-	-	-	-
TF2	3		-	-	-	-	-	-	-
DW3	3		-	-	-	-	-	-	-
DW2	3		-	-	-	-	-	-	-
DW1	3		-	-	-	-	-	-	-
Reference Bay									
RP1	3		-	-	-	-	-	-	-
RP2	3		-	-	-	-	-	-	-
RP3	3		-	-	-	-	-	-	-

Values represent the factor by which 2009 replicate averages are higher than CCME guidelines.

Even though a percentage of samples may be higher than a guideline amount, the calculated average may be below the guideline.

a) Canadian sediment quality guidelines for the protection of aquatic life (CCME 2002)

b) ISQG = Interim marine sediment quality guideline

c) PEL = Probable effects level

3.6.2 Historical Trends in Sediment Quality

Marine sediment quality data for Roberts Bay and/or Hope Bay were collected in: 1997, 2002, and 2009. Historical sediment quality trends are shown in Figures 3.6-11 to 3.6-18. The western basin of Roberts Bay is the only site for which more than one year of sediment quality data are available. Sediments from Hope Bay and the eastern basin of Roberts Bay were only sampled in 1997, and Reference Bay sediments have not been collected prior to 2009.

The differences among annual data sets in terms of when (sampling dates) and where (sampling depth/location) samples were collected can have a significant effect on monthly averages of parameters. Comparisons between years are further complicated by differences in analytical methodology and detection limits. Figure 2.3-2 shows the historical sediment quality sampling locations, and Table 2.3-2 presents the methodological details of historical sediment quality sampling.

In the western basin of Roberts Bay, most sediment quality parameters were similar among years (e.g., moisture content, grain size, arsenic, and iron). As observed in 2009, sediment chromium (Figure 3.6-14) and copper (Figure 3.6-15) concentrations in samples from 1997 were naturally elevated and were occasionally higher than CCME ISQGs. However, concentrations of these metals in 2002 samples were slightly lower than other years, and were consistently below CCME sediment quality guidelines.

The 2002 sediment quality sampling program included analyses of various hydrocarbons (monocyclic volatile hydrocarbons, polycyclic aromatic hydrocarbons, and monocyclic aromatic hydrocarbons) in Roberts Bay sediments. As seen in 2009 samples, concentrations of hydrocarbons in 2002 sediment samples were always below detection limits.